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Editorial Notes

That Most Cherished Institution

THE British Coal Utilization Research Association has made rapid progress during its short existence. In 1938, as we mentioned in these columns last week, it enjoyed an income of £29,000, of which £9,500 was in the form of a Government grant. From this fact alone the Association gained much publicity at its first annual meeting. In his Address as President, Sir Evan Williams had a story to relate which must have well satisfied the coal industry—a story of many research activities well conducted. One of these activities lies in the attempt to reduce smoke from the open domestic firegrate burning raw coal. On the face of it this is quite a worthy object, but one may well ask why time, energy, and money should be expended in this attempt when the remedy not merely for the reduction of domestic smoke but for its abolition is at hand. The proved and economical remedy is the use of gas and coke in substitution of raw coal, and we are confident that in time this substitution will take place as a result of more education of the public on the matter. In spite of considerable propaganda on the Gas Industry's part, the fact remains that relatively few people are aware that it need cost them no more to have clean instead of smoky chimneys. And very few people know how much they do spend on raw coal—an expense which, ingrained through long habit, is rarely analyzed. The public must be taught to think in terms of all-in fuel costs, and taught to disbelieve in the open coal fire, which Sir Evan Williams described as that "most cherished of British institutions."

While the coal industry seeks to palliate the smoke nuisance, the Gas Industry can abolish it, to everybody's benefit. That a great deal remains to be accomplished is well brought out in an article on fog by Dr. J. S. Owens which appears as an interesting and useful feature of the 24th Report on the Investigation of Atmospheric Pollution (H.M. Stationery Office). In this Dr. Owens points out that if its escape is sufficiently impeded the smoke produced in London in two or three hours on a winter morning is enough to make a dense smoke fog. The culprit is that "most cherished institution," and the reason why the raw coal fire is cherished is because the Gas Industry has only recently come to think of the continuous heating load in terms of gas and coke sold at prices competitive with raw coal. It is only in recent years that the Industry has paid anything like adequate attention to the preparation of a solid smokeless fuel which will give satisfaction to the user, and it is obvious from its gas pricing policy that it has not until very recently seriously considered the replacement of raw coal by gas for continuous heating. Fortunately there are many indications of a real awakening in the Industry to the practical possibilities of the continuous heating load with the abolishment of smoke, and there is no doubt that the raw coal fire will become less and less of a "cherished institution."

The future vast extension of the Industry rests on the translation of this new conception into practice, and the new outlook will necessarily bring its own problems. How some of these problems are being tackled and solved was well demonstrated at the meeting of The Institution of Gas Engineers last month, and the closer co-operation between the Institution and the Society of British Gas Industries in the matter of research holds out great promise for rapid development. The Paper presented at the meeting on "Comfort by Gas Heating," by Mr. Andrew and Mr. Barron, and the discussion to which it gave rise, were of the utmost importance and have given the Industry plenty to think about. The Authors described and exhibited a new design of gas fire, the result of work undertaken in the Watson House Laboratories of the Gas Light and Coke Company, which they stated reproduces all the physical characteristics which have made the coal fire so popular. This gas fire has similar distribution of radiation, emission spectra, distribution of light and dark patches, and even the flame of a coal fire. It was explained at the meeting that a test had been made of about 50 fires of the new type fitted in living rooms on check meters in the Gas Light and Coke Company's area. Eleven people were able to give a reasonable estimate of the amount of coal used during the previous year and six people the amount of coke. Gas proved competitive on cost

at 5·4d. per therm compared with coal and 3·4d. per therm compared with open fire coke. The average annual consumption was 220 therms.

For those, then, who like the appearance of the coal fire with its flickering flames, gas fires similar in appearance are now available. But, as Dr. Harold Hartley, of Radiation Ltd., pointed out at the meeting, there are two schools of thought—those who like, as he termed it, the "imitation solid fuel fire" and those who prefer a fire of formal structure, whether it be of the inset or ordinary hearth type. He suggested that the formal structure may ultimately have the greater appeal. In any case the gas fire, formal or otherwise, has been wonderfully improved during recent years, and Dr. Hartley's outline of some of the research work carried out by his firm provided further evidence of how well served the Industry is by the manufacturers of appliances and how much of its success it owes to them. He referred to a type of fire which has been developed embodying a series of parallel members, heavy in structure, to serve as the front refractory screen through which the combustion chamber is viewed. The resulting design is markedly different from the normal radiant fire, and the new fire, which is silent, emits energy of high penetrancy.

But let us make sure that we take full advantage of these advances in gas fire design, and make a determined effort to capture the continuous heating load. This is to be gained only by adopting attractive tariffs, two-part or otherwise; and, as we have said, the Gas Industry has much work to do—and it is urgent work—in educating the public to think in terms of all-in fuel costs. The continuous heating load offers such vast possibilities that no effort should be spared in gaining it.

New Carbonizing Plant

THE Gas Industry is remarkably fortunate in the flexibility of the process it operates to meet changing needs, and it is similarly fortunate in the wide choice of carbonizing plant it enjoys. This choice increases and all types of carbonizing plant are constantly undergoing improvement as knowledge of the materials of which it is constructed becomes greater. In this regard the gas engineer owes much to the research workers in other fields—in the metals industries and the ceramic industry, for example—and it is good to see greater recognition of the value of co-operation. The makers of gas making plant have not been slow to take advantage of the improvements effected as a result of research and to embody these improvements in their plant. The result has been plant of greater durability and consequently lower operating cost.

There is another form of co-operation which has proved of the greatest possible value—co-operation between gas undertaking and plant manufacturer, and this was never better exemplified than in the development of the W-D static vertical retort which formed the subject of the Institution Paper by Mr. Grogono and Mr. Finlayson. Four years elapsed between the preparation of the first sketch of the W-D static vertical and the putting to work of the first commercial unit at Southampton in February of this year. Three years of that time were spent on work on a full scale experimental plant erected by the Woodall-Duckham Company at the works of the Croydon Gas Company, and we do not think that any plant could have been tested more thoroughly —an impression gained after a close inspection of the plant last year. The Paper gave an excellent and concise account of the work carried out at Croydon during the period from April, 1936, when the plant was put to work, to October, 1938, when it was shut down on the completion of the experimental programme. From the commencement the plant was treated as a normal carbonizing unit subject to normal attention. The plant was complete with coal and coke handling equipment and gas treatment plant for the recovery and measurement of the various products of carbonization. At the conclusion of the testing programme the retort had carbonized 2,800 tons of coal.

The underlying principles of the static vertical retort are very interesting. The aim was to associate the advantages of the intermittent vertical chamber with the advantages of the continuous vertical retort process as regards the extraction of cool coke and continuous steaming, and we think the results obtained from the static vertical plant must have met the hopes and expectations of the designers. The retort gave a higher thermal yield of gas per ton of coal carbonized than either intermittent vertical chambers or continuous vertical retorts. As the calorific value falls, the advantage of the static vertical retort in this respect increases. The density of the coke is intermediate between that of coke made in intermittent vertical chambers and that of coke made in continuous vertical retorts. The calorific value of the gas made can be changed over wide limits without altering the carbonizing cycle and without substantially modifying the volumetric gas output per retort per day.

It would appear, then, that the static vertical retort, besides eliminating the nuisance resulting from the wet quenching of coke and reducing to a minimum the dust and smoke nuisance when charging, is a very flexible unit, and that cracking conditions have been very materially improved. A criticism which may, we think, be made is the effect which heating part of the coke made twice may have on the uniformity of the product—and uniformity in coke quality is obviously important. However, the plant has undoubtedly many technical attractions. Naturally the Authors of the Paper could not go into the all-important matter of cost of gas production. It was stated at the meeting that the capital cost of the plant was greater than that of intermittent chamber plant, and it was suggested that maintenance costs would be higher. But the incidence of these charges can only be found on commercial working, and it may be that they will be offset by the higher thermal yield of gas per ton of coal carbonized and the absence of steam from quenching. We must await the "proof of the pudding," and all gas engineers will share our hope that before long Mr. Whitehead will be in a position to give the working results of his static vertical plant at Southampton. At the meeting he said that the two most striking features of the plant in operation are its smooth working in spite of its apparently complicated nature from a mechanical point of view and, secondly, the greatly improved cleanliness of the process. If, he added, the thermal yield proves to be on a commercial scale as good as that obtained from the Croydon experimental plant, the installation at Southampton will be amply justified. The next W-D static vertical plant will come into action at Cambridge, and we shall look forward to the results of the working of this plant too.

Armament Profits Duty

A CONSIDERABLE amount of time has been devoted by the House of Commons to consideration of the proposed Armament Profits Duty. The provisions relating to the Duty were first produced during the Committee Stage of the Finance Bill; only a few days elapsed between the introduction of the proposals of the Government and their con-

sideration by the House of Commons. Such procedure affords but little opportunity to the interests which may be affected to consider an entirely new form of taxation. No business will be liable to the new tax unless the total receipts of the business under armament contracts in any year are in excess of £200,000. This provision would, it might be imagined, have ensured, as things stand to-day, that gas undertakings would be little concerned with the proposals. The tax is, however, to be in force for three years, and he would be a brave man who would dare to foretell what might be the position so far ahead.

The term armament contracts is defined in the broadest terms which are wide enough to include anything required for the purposes of the Armed Forces of the Crown. It is left to the Minister by order to specify the articles and materials supplied to the Armed Forces that are not to be regarded as armament contracts. This is a form of legislation which nothing but the present national emergency could justify. It will be left to the Minister, and not to Parliament, to decide the actual incidence of the tax. The apprehensions of the Gas Industry were aroused, particularly as a declaration had been made that the Duty was not to apply to contracts with the Armed Forces for the supply of food and coal. There is little justification for the application of the Duty to Gas Undertakers since, in so far as they are Companies, their dividends are regulated and controlled by Act or order. Indeed, the Industry was expressly exempted from National Defence Contribution on that ground.

To test the view of the Government on this matter an amendment was moved by Mr. W. Ross Taylor, M.P., the effect of which was to provide that Public Utility Undertakers should be exempt from the Duty. Mr. Burgin, for the Government, stated that "it was never intended that water, gas, electric power, and other statutory undertakers should come within the Clause." The Armament Profits Duty will therefore have no application to the Gas Industry.

Electrical Fears

We well recollect the scare which last December's cold spell gave to many electricity undertakings. December of 1938 brought home to undertakings supplying electricity at low rates for domestic purposes that poor load factor heavy current consuming apparatus can create a disastrous situation. During the cold spell increase in maximum demands was due to heating apparatus with negligible load factor. A correspondent in one of the electrical papers expressed the view that increase in such demands may amount to a menace, and he wrote of the injustice caused to a certain class of consumer by the low rates charged by some electricity undertakings in an attempt to capture the cooking load. Any loss incurred by the supply to one class of consumer must be borne by other consumers, and there must be many instances where electricity supplies for cooking are provided at a loss.

With anything like a substantial increase in domestic cooking and heating by electricity, supply undertakings would suffer badly. The *Electrical Engineer* has recently been delving into the matter, and has issued a questionnaire to a large number of undertakings. Many of the replies are illuminating and show how anxious some of the electrical engineers are concerning the effect of the cooking load on maximum demand. At Eastbourne, for instance, in consequence of the increase in maximum demand, the electricity undertaking had no alternative three years ago but to stem progress by ceasing to carry out free wiring in connexion with hired cookers except for new houses, and to restrict advertising and propaganda work in regard to cookers. The Ashford electrical engineer expressed the view that when the morning peak equals the evening peak cooking is no longer a "by-product," but begins to affect the capital expenditure on plant or else the payments to the grid. Beyond this point where the day load equals the evening load it cannot be economical to develop electric cooking at ½d. a unit. Even at ¼d. a unit it is questionable whether further development is economic. The Ilkley electrical engineer finds the cooker load is "now affecting the maximum demand in such a way as to cause some concern." At Felixstowe the cooking load development may have to be curtailed. The Author of an article in the same electrical journal stated that many engineers who have made a practice of developing the domestic cooking load by extensive propaganda, cheap simple hire terms, and an all-in tariff with a small quantity charge and electricity at ½d. a unit are now beginning to wonder if the business is economically sound.

It is not only a question of cost, however, which will retard the development of the electrical cooking load. Speed and convenience are also factors of importance, and the wonderful flexibility of gas in this regard gives it a very real advantage. Discussing the cooking load, the *Electrical Engineer* bewailed the fact that many electric oven "converts" use "gas tops"—a matter which calls for "most serious consideration." "Gas rings," our contemporary admits, "have the essential convenience of close regulation, but the cost of maintenance of poorly regulated electric boiling plates has seriously weakened the most valuable service electricity can give to the people."

From the electrical point of view the foregoing is not too bright a story. The next move of electricity undertakings may be to launch appeals to the Central Electricity Board for revised charges for current to meet an uneconomic state of affairs created by themselves. The best move the Gas Industry can make amid all these electrical fears is to continue stressing the advantages of gas—its proved economy, reliability, convenience, and swiftness—and then allow economic realities to come to roost in electrical circles.

The Sincerest Form of Flattery

The pretty little domestic scene in which mother and daughter stand, dressed for outdoors, beside the cooker has long been intermittently a feature of Radiation advertising. We can remember examples for years back. The theme is, of course, that while mother goes shopping and daughter presumably to school, the "Regulo"-controlled cooker will take good care of the midday meal.

So familiar have Radiation advertisements on this theme become that it was something of a surprise recently to see the same pretty little scene enacted around the cooker in an E.D.A. advertisement. No! to be quite just we must give our electrical friends credit for some originality. As far as we can remember the gas mother and daughter had always just returned home; the electricals, on the other hand, are just departing on their respective errands. It is, perhaps, facetious to suggest that there is a reason for this slight variation, but can it be that the electrical family find it wiser to tell their story to the world *before* they go out, lest on their return the oven has belied their hopes? We hardly think that such frankness was in the minds of our friends, but, in the words of our not very original heading, "imitation is . . ."

Of Good Augury

Development from a small engineering concern into a business of nation-wide repute and employing thousands of workpeople provides a story which stirs the imagination, for it is evidence of unceasing effort on the part of those early pioneers whose faith in their products the passage of time has amply justified. Such a

story as this lies behind the recent opening of the splendid new works and offices of Keith Blackman, Ltd., at Tottenham, which are described and illustrated on later pages of this issue. Of the new buildings themselves, covering as they do more than ten acres, we cannot but speak with unstinted praise, for rarely have we seen such bright, airy, and pleasant surroundings for the staff. It is, perhaps, to be expected that the finest advertisement for the "K.B." heating and ventilating systems should be found on their own premises; but even so, the firm deserve to reap all the benefits which must essentially accrue by way of increased efficiency from a staff working under conditions which automatically adjust themselves to the vagaries of the English climate. So important a step as the opening of new works like these is encouraging, not merely because it concerns a firm known and respected throughout our own Industry, but because it may be regarded as a sign of confidence in the future of British trade generally; indeed, so wide and varied are the applications into which "K.B." products of one kind or another find their way that the word "generally" bears an almost literal interpretation. Keith Blackman, Ltd., are to be congratulated upon an enterprise which is worthy of all success.

Personal

Miss Agnes S. Keay, daughter of Mr. ALEXANDER S. KEAY, Manager of the Inverbervie Gas Department, was married in Old Bervie Parish Church on July 1 to Mr. Alfred H. Cochrane, of Brockley, London.

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Mr. ARCHIBALD STEWART, who has retired from the position of Engineer to the Blairgowrie Gas Company, Perthshire, after twenty-two years' service, has been presented by the employees with a chiming clock, the gift being handed over by Mr. James Donaldson, the oldest employee. Mr. Stewart is retiring for health reasons.

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Mr. ROBERT STEWART, Engineer and Manager of the Auchterarder Gas Light Company, has been appointed Engineer, Manager, and Secretary of the Thurso and North of Scotland Gas Corporation, Ltd., in succession to Mr. Eric Shiell, who has succeeded his father at Innerleithen. A native of Markinch, Mr. Stewart received his early training with Lochgelly Gas Company, and afterwards at St. Andrews. He went to Auchterarder in 1930, and under his managership the Works have been reconstructed.

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Mr. J. POWDRILL, Gas Engineer and Water Works Manager to the Rawmarsh U.D.C., has been appointed Manager of the Pontypool Gas and Water Company in succession to the late Mr. T. B. Pearson, who was Managing Director and Secretary.

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The staff and workmen of the Ipswich Gas Light Company recently assembled in their Works Hall to make a parting gift to Mr. C. E. Wright, Chief Engineer, whose retirement has already been announced in these columns.

Mr. A. W. Mather, the Company's Accountant, who presided, said that the Directors, who regretted their inability to attend, had a few days previously presented Mr. Wright with a silver salver. Mr. G. A. Mallett (General Manager and Secretary of the Company), who was on holiday abroad, had written asking to be associated with their good wishes.

Mr. Wright had been with the Company for thirty-nine years, starting as Chemist, and during his long and loyal service he had endeared himself to the workmen and staff alike, who were sorry to have to say "good-bye" to him on his retirement for reasons of health.

Mr. W. J. C. Garrard, who has been appointed Chief Engineer in succession to Mr. Wright, warmly endorsed the sentiments of respect and admiration which had been voiced, and mentioned the coincidence that he himself had that day completed twenty-five years' service with the Company. Messrs. W. Gardiner and F. Say spoke on behalf of the workers on the distribution side and productive side respectively.

Mr. Mather then presented Mr. Wright with a wireless set and a Westminster chiming clock.

Mr. Wright thanked all for the gifts and for the loyal support they had always accorded him. He was grateful to the Directors for the generous way they had treated him, and for their inauguration and support of the superannuation scheme, under which he could look forward to a comfortable and happy retirement.

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Councillor SYDNEY C. ADNITT, a Director of the Northampton Gaslight Company, has been elected to the Aldermanic bench as the Senior Conservative in point of service on the Council. By so doing, he is following in the footsteps of his late uncle who was an Alderman for many years and also Mayor of the town.

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Mr. DOUGLAS W. DAVIDSON, B.Sc., has been appointed Chief Technical Assistant to the Aberdeen Gas Department. He received his preliminary training in Edinburgh, where he attended evening classes at the Heriot-Watt College for five years, and received Ordinary and Higher National Certificates in Gas Engineering in 1937. He was awarded a scholarship tenable at Leeds University and has now graduated B.Sc. of that University. Mr. Davidson was previously in the service of the Dunfermline Corporation Gas Department.

Amalgamation and Grouping

Keighley and Haworth.

One of the objects of a Special Order, under the Gas Undertakings Acts, 1920 to 1934, for which the Keighley Corporation give notice that they intend making application to the Board of Trade is the merging of the Gas Undertaking of the former Haworth U.D.C. with that of the Corporation.

Sheffield, Eckington & Mosborough, and Killamarsh

A Special Order, for which the Sheffield Gas Company give notice that they intend applying to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934, has for its objects *inter alia* the sale and transfer to and vesting in the Company the Eckington and Mosborough Gas Company and the Killamarsh Gas Light and Coke Company.

South-Western and Glastonbury.

The transfer of the Gas Undertaking of the Glastonbury Corporation to the South-Western Gas and Water Corporation, Ltd., took effect on July 1 in accordance with a resolution passed at a meeting of the Town Council on June 26.

William Murdoch Centenary

Forthcoming Celebrations at Smethwick

In presenting the annual report of the Gas Department at a meeting of the Smethwick Town Council, the Chairman, Alderman Samuel Smith, referred to the forthcoming centenary, on Nov. 15, of the death of William Murdoch. The Gas Committee, he said, was arranging a programme of events for the suitable celebration of this occasion, for the fact was often lost sight of that it was at Soho, Smethwick, within the boundary of the Borough, that many of Murdoch's early experiments were carried out in the manufacture of coal gas on a practical scale. The Chairman went on to say that he was pleased to be able to announce that Miss W. Murdoch Barrows, a direct descendant of William Murdoch, had consented to open the new Demonstration Room which was now in the course of erection, and this would be known as the "Murdoch Room." Alderman Smith also had pleasure in announcing that the firm of Messrs. W. & T. Avery, Ltd., Soho Foundry, had very kindly presented to the Committee an oil painting of William Murdoch, and this was to be given a prominent place in the new Demonstration Room. The Chairman said that on the appropriate occasion he hoped to take the opportunity of acknowledging the firm's generosity.

Forthcoming Engagements

July.

13.—I.G.E.—Joint Committee on Complete Gasification under Pressure, 3 p.m.

17.—L.C.C.A.—Finance Committee, 10.45 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 2.30 p.m.

18.—I.G.E.—Gas Education Executive Committee, 2.30 p.m.

20.—B.G.F.—Meeting of Joint Exhibitions Committee, Gas Industry House, 2.30 p.m.

21.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.30 a.m.; Joint Research Committee, 2.30 p.m.

24.—L.C.C.A.—Technical Committee, 3 p.m.

25-26.—Irish Association.—Annual Meeting in Dublin.

News of the Week

The Tender of the Loughborough Gas Company for lighting the streets of Quorn has been accepted by the Parish Council.

In Our Description of the gas-operated wireless set in last week's issue, we stated that the Milnes H.T. converter gives a supply up to 150 volts at 15 to 20 amps. This should, of course, have read 15 to 20 milliamps.

For Approval by Resolution drafts of the following Special Orders for which application has been made to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934, have been laid before both Houses of Parliament: Ashford, Bridgnorth, Glasgow, Huddersfield, Musselburgh, Rhondda, and Silsby.

The Board of Education will hold an Examination, known as the Science Scholarships Examination, towards the end of April, 1940, at various Centres for the purpose of awarding Royal Scholarships and Studentships in Science and Whitworth Scholarships in Mechanical Engineering. Full particulars of this Examination and Forms of Application can be obtained from the Secretary, Board of Education, Alexandra House, Kingsway, London, W.C. 2, or from the Secretary of The Institution of Gas Engineers.

In Consequence of Higher Coal Prices, the Stirling Gaslight Company have decided to increase the price of gas by ½d. per therm, or 2·2d. per 1,000 cu.ft. as from Aug. 15. In Stirling gas will cost the consumer 9d. per therm or 3s. 3·6d. per 1,000 cu.ft. In Bridge of Allan, which is supplied from Stirling, the price will be 1s. per therm or 4s. 8d. per 1,000 cu.ft.

The Growing Demand for Gas at Gainsborough has influenced the Gainsborough Urban Council to instruct a subcommittee to make investigation into the purchase of a site for a new gasholder. The Gas Committee reported that further storage accommodation was required owing to the increasing load at the Gas-Works and particularly because of the proposal by the Council to supply gas to outlying villages.

Carnival Successes were scored last week by the Industry at Cannock and Cheadle. At the Brownhills Carnival the Steers Challenge Cup for the best advertising tableau was won by the Cannock Gas Company with "Cook by Gas with a 'New World' cooker." At the Cheadle Hospital Carnival the Cheadle Gas Undertaking won first prize in the Traders' Class with a tableau "Gas Never Fails."

South Yorkshire Advertising Group

Visit to Staveley Works

A very pleasant gathering took place at Chesterfield on July 7 when the members of the South Yorkshire Advertising Group paid a visit to the Works of the Staveley Coal and Iron Company, Ltd.

This was made the occasion for the presentation of a barometer to Mr. J. Powdrill, Gas Engineer and Water Works Manager of the Rawmarsh Urban District Council, who, as announced in our personal columns, is leaving to become Manager of the Pontypool Gas and Water Company.

Mr. E. J. Wellens, Chairman of the Group, spoke of the good work Mr. Powdrill had done in connexion with the advertising schemes and business of the Group generally, and how much the members appreciated the services he had rendered. As they were honoured by the presence of Mr. H. H. Berresford, J.P., newly appointed Deputy Managing Director of the Staveley Coal and Iron Company, Mr. Wellens asked Mr. Berresford if he would kindly make the presentation to Mr. Powdrill on behalf of the Group. Mr. Berresford, after stating what pleasure it gave him to perform the ceremony, referred to the work of Mr. Powdrill, and extended to him his personal congratulations, wishing him every success, happiness, and prosperity in his new appointment.

Other members of the staff of the Staveley Coal and Iron Company and members of the Group also extended their good wishes.

Opportunity was also taken on this very pleasant afternoon of extending to Mr. Berresford congratulations on his appointment as Deputy Managing Director of the Staveley Coal and Iron Company.

A.R.P. Notes

Rochdale and Inter-Linking of Mains.

In the annual report of the Rochdale Corporation Gas Department mention is made of a scheme which aims at giving continuity of supply in the event of damage to plant by enemy air attack, and the linking up of the Rochdale, Oldham, and Heywood services. The estimated total cost of this work is £11,000. Towards it the Government have sanctioned a grant of 50%.

Perth Measures Complete

Perth Corporation have taken full measures to ensure continuity of gas supply in the event of an emergency and on July 5 members of the Town Council and officials paid a visit to the Gas-Works to inspect the new plant which has been erected during the past two years at a cost of almost £40,000. Mr. A. C. Rea, Engineer and Manager, and members of his staff acted as guides.

The visitors took the opportunity of inspecting the preparations being made for the safety of workers and plant. An underground tunnel below the coal store forms an effective bomb-proof shelter for over 100 men. A sample steel window shutter which can easily be swung into position to close the windows of the various machinery houses was demonstrated. It is made of steel plate and is hinged for easy and quick closing.

Outside plant will be protected by 20,000 sandbags. Three repair squads have been formed to deal with damage to distribution mains and services, and the employees are being equipped to tackle their work in any emergency.

Women's Gas Council

Miss K. M. Halpin, Organizing Secretary of the Women's Gas Council, is now back at Gas Industry House. Readers will remember that last January Miss Halpin was seconded for Government work in connexion with evacuation. She has been responsible for drawing up plans and schemes whereby the Women's Voluntary Services can assist the local authorities in the vast organization necessary in reception areas. This work has included the organizing of child welfare and canteen training, and the planning of arrangements for communal feeding. We are glad to take this opportunity of congratulating her on this fine piece of work, and welcoming her back.

Miss Halpin has been put on to the Executive Committee of Women's Voluntary Services, and on to the Evacuation Sub-Committee, and she will therefore be able to watch her plans develop.

Farewell to the Lyceum

Gas Lighting an Attraction on Its Play Bills

"Long live the memory of the Lyceum"—with these words the curtain rang down on July 1 for the last time at the Lyceum Theatre. Perhaps the most famous of all London playhouses, owing to its long association with the immortals, Henry Irving and Ellen Terry, the Lyceum is now being demolished, and while it will always be remembered for its wonderful record of theatrical history, it will also be recalled that the old theatre was one of the first places of entertainment to use gas for lighting. In connexion with the final production, John Gielgud's "Hamlet," a special souvenir programme was issued, and it is therein recorded that: "The Lyceum—or English Opera House—was one of the very first places of public entertainment to be lit with gas, and in 1817 the introduction of gas lighting on the stage was made a great feature on the bills. Gas was extended to the auditorium later in the same season. The Olympic—the first place to adopt gas lighting—had installed it two years previously." Those were the great days of the theatre, and it is pleasing to note that recognition has been given to the enlightened policy of the owners of the Lyceum, who, soon after the introduction of gas for lighting, were quick to appreciate the enormous benefits that this would give to the theatre.

INSTITUTION OF GAS ENGINEERS

ANNUAL MEETING, June 6 to 9

WRITTEN CONTRIBUTIONS AND REPLIES TO THE DISCUSSIONS

In this number of the "JOURNAL" we complete publication of the written contributions to the discussions and Authors' replies.

The Test Installation of Static Vertical Retorts at Croydon Gas Works

Communication No. 208

by
WALTER GROGONO, M.I.Mech.E., M.Inst.Gas E.
(Engineer, Croydon Gas Company),
and
T. CAMPBELL FINLAYSON, M.Sc., M.Inst.Gas E., M.I.Chem.E.
(Deputy Technical Director, The Woodall-Duckham Companies).

Mr. N. Calvert (Nottingham) wrote: It must not be forgotten that "cost per therm" is far more important than "therms per ton" and I am keenly looking forward to the publication of results from a large-scale plant.

I am particularly interested in the results obtained from Nottinghamshire coals, as these appear to be similar to those used in the continuous vertical retort plants at Nottingham. With these coals we are obtaining 80 therms of 475 B.Th.U. gas and approximately 16·5 gal. of tar per ton from upwardly-heated continuous vertical retorts, and I note that the Static Retort test gave 87 therms of 474 B.Th.U. gas with 12·55 gal. of tar per ton. It appears that the total thermal yields of gas and tar per ton of coal from the two plants concerned are very similar but that the Static Retort has the advantage in gas yield.

A comparison between the volumes of the various constituents of the gas made per ton of coal in the Static Retort at Croydon and the continuous vertical retorts at Nottingham shows the major difference to be in the yields of unsaturated hydrocarbons equal to approximately five therms per ton in favour of the Static Retort.

Though the Static Retorts are an improvement over the intermittent vertical retorts as regards freedom from smoke and dust, they are still apparently inferior to the continuous vertical retorts in this respect. Would it not be worth considering the use of a coal feed similar to that used in the continuous vertical retorts and so completely eliminating the smoke nuisance? This is very important when so many Gas Works are in residential areas, and it would help the Gas Industry in its work on smoke abatement.

It is stated in the Paper that the calorific value of the gas is easily altered, but in general a gas engineer requires a constant calorific value but an easily variable output. Could the Authors state how their plant compares with the continuous vertical retorts in this respect?

I was rather disappointed to read that the coke was little, if any, better than intermittent vertical retort coke and much inferior to continuous vertical retort coke as regards its performance in the open grate. As the sale of domestic coke plays a very important part in the economics of gas manufacture and every effort is now being made to improve the quality of the coke for the domestic market, it is quite possible that an engineer would be unable to recommend a static vertical installation to replace a continuous vertical installation for fear of losing his coke market.

The Authors' Reply.

The Authors, in reply, wrote: At the outset the Authors wish to tender their thanks to the various speakers who took part in a Discussion which, by reason of the many interesting points raised, must be regarded as adding considerably to the value of the original contribution. Before discussing the various technical points raised, the Authors would like to dispose of one general point.

The phrase "static vertical retort" used throughout the Paper is intended to imply the system of intermittently operated two-stage vertical retorts developed by the Woodall-Duckham Companies, and may be regarded as a trade name to differentiate the system from the systems of continuous vertical retorts and intermittent vertical chambers designed by the same undertaking. This fact has been published at frequent intervals in the trade press. In an attempt to avoid proprietary advertisement in a professional publication, the Authors seem inadvertently to have caused some misunderstanding.

The Authors were particularly gratified to listen to Mr. Whitehead's account of the behaviour of the first commercial unit of Static Vertical Retorts built upon the experience gained at the Croydon test plant. They await with great interest the publication of his results when separation of the gas stream becomes possible. With reference to the two points raised by Mr. Whitehead about correcting all gas results for the addition of air for purification and about expressing results on "normal" coal, both these corrections were applied so as to record in the tests, yields which would be commercially attainable. Nitrogen contents on the test plant could be maintained as low as 2·5 per cent., which would have made it possible to add a greater quantity of blue water gas to give any particular final calorific value of mixed gas, thus claiming gas yields higher than could be obtained in commercial practice. Similarly, when giving results from entirely different coals which varied in their normal ash *plus* moisture content from 6·0 to 16·5 per cent., calculation to a common dry ash-free basis gives results which are commercially misleading. When comparing results on similar coals, it is a matter for individual preference whether to

correct results to a standard or "normal" basis, or to an ash-free dry basis.

Mr. Whitehead also stated that by reason of its construction and more complicated mechanical features, the Static system "necessarily entails higher capital cost and maintenance charges than does the intermittent vertical chamber." Whilst the former is indisputable, the latter can only be established over a number of years of operation. The Authors would, however, suggest that there are certain favourable features in the design of the Static Vertical Retort which may result in the maintenance cost of the new system being no higher per therm of gas made than that of intermittent vertical chambers.

Mr. Evans's remarks on the thoroughness of the methods employed at the test plant are much appreciated. The Authors are also grateful to him for the careful scrutiny he has given to the figures and are glad that he can confirm the views expressed in the Paper that the Static Vertical Retort process leads to a conservation of hydrocarbons.

High Yields at Tottenham.

Mr. Smith suggested that the comparative results as between intermittent vertical chambers and Static Vertical Retorts were unfavourable to the former. Mr. Smith is certainly obtaining consistently high yields on his intermittent vertical chamber plant at Tottenham, but just as it was shown that results for Static Vertical Retorts vary according to the coal, so, of course, do results for intermittent vertical chambers vary. The Authors feel that curves 2 and 3 of Figure 1 for average quality Durham coal containing 10 per cent. ash *plus* moisture are truly comparative. With a better coal mixture as used by Mr. Smith, the intermittent vertical chamber curve would start somewhere between curves 1 and 2 and would finish between curves 2 and 3. On his mixture, however, the Authors feel sure that over the range of calorific values tested the Static Vertical Retort would give an improvement in thermal yield of the same order as shown in the difference between curves 2 and 3. Mr. Smith is correct in assuming that the hydrocarbon enrichment value generally increased as the calorific value fell. On any given coal the Authors would expect to find the H.E.V. higher with Static Vertical Retorts than with intermittent vertical chambers over the whole range 530 to 460 B.Th.U. It is to be noted that the H.E.V. figures on Table 9 are corrected to "normal" coal.

Mr. Stewart's valued contribution brings out a number of interesting points. It was particularly satisfactory to hear that the Shoreditch results were almost identical with those given in the Paper under discussion. Mr. Stewart suggests that the Authors might have given more attention to an account of methods of operation and difficulties in commercial practice. They feel that Section III of the Paper gives a very detailed description of the Static Vertical Retort process, and as regards difficulties they would repeat the sentence on p. 15 "From the commencement of operation in April, 1936, to the shutting down of the plant at the conclusion of the test programme in October, 1938, no alterations or repairs to the Static Vertical Retort were required." This was, from their point of view, the complete answer to the second object of the investigation.

The answer to a number of Mr. Stewart's questions can only be given as experience accumulates. The Authors can, however, state that they would not expect any difficulty in carbonizing any coal in a Static Vertical Retort which can successfully be carbonized in an intermittent vertical chamber. As regards the use of a coke pad between the lowered coke charge and the new coal charge, Mr. Stewart is correct in assuming that this is a consequence of the gentle and shockless method of coke extraction. The utilization of a coke pad has been preferred to any alternative method of breaking up the coke charge, which might subject to shock the complicated structure of refractories, castings, and steelwork of which a carbonizing plant is composed, as, for example, by the sudden dropping of the charge within the apparatus.

The Authors are also grateful to Mr. Battersby for his confirmation that the results suggested in the Paper can be maintained in commercial practice on a plant similar in principle. In answer to his question whether the 10 min. standing time was sufficient to keep the Static Vertical Retort free from scurf, the Authors would state that it is necessary in addition to scurf the retorts in the usual way, the total loss of time representing about 6 per cent.

Mr. Moys's remarks have been studied with much interest because he has the advantage of having seen both West-vertical chambers and the Croydon test plant at work. As regards his statement that "it was apparent that attempts had been made to overcome some supposed difficulties with the Shoreditch plant," the Authors can assure Mr. Moys that the Static Vertical Retort, as built at Croydon, was an independent development based on practical carbonizing experience. Mr. Moys is also a little disappointed in the lack of information in the Paper. The Authors quite agree that a full thermal balance on a commercial unit during a month's run is far superior to the results they have published in this contribution. They cannot, however, trace the publication of this test run on the Shoreditch plant referred to by Mr. Moys. Even after this interval of six years or so the publication of the results would be of great interest to the Authors and probably to the Gas Industry as a whole. Mr. Moys must have missed Table 10 when he stated he could not find mention of temperatures in any part of the plant.

The Authors cannot see any advantage in the suggestion that gas makes should be corrected to 500 B.Th.U., more particularly because some arbitrary figure must be taken for the calorific value of the added water gas, which, as explained in the Paper, differs with different coals when employing the Static Vertical Retort process. The Authors would commend to Mr. Moys the use of the H.E.V. index as being a better method of comparing yields of gas at different calorific values.

Coke and Tar.

The remarks of Mr. Brown on coke and tar are of considerable interest and worthy of further investigation. Although in general, methods for the cracking of tar in carbonizing plants seemed to give disappointing results, the Authors agree with Mr. Brown that the Static Vertical Retort might overcome some of these difficulties, and they thank him for bringing this point forward.

Dr. F. S. Sinnatt's written contribution to the discussion is much appreciated. Although time did not allow for the programme of tests carried out at the Croydon test plant to cover the carbonization of blends of caking and non-caking coals, this development had been considered as one for investigation. The Authors are confident that any blend which can be successfully carbonized in an intermittent vertical chamber to produce a coherent coke can equally well be carbonized in a Static Vertical Retort. The work at the Fuel Research Station on the production of coke in intermittent vertical chambers utilizing a predominant percentage of non-caking coals may well prove of very great importance to the Gas Industry in the future, and the Authors are grateful to Dr. Sinnatt for bringing forward this additional possible utility of Static Vertical Retorts.

In reply to Mr. Calvert's suggestion that a coal feed similar to that used on a continuous vertical retort might be used on a Static Vertical Retort, the Authors would remind Mr. Calvert that the essential requirement is to charge, say, three tons of coals as rapidly as possible, after the introduction of a coke pad. For this dual purpose a travelling charging car has been preferred as, amongst other advantages, this device eliminates the mass of top ironwork which makes adequate ventilation more difficult. As Mr. Whitehead remarked, on the first commercial plant of Static Vertical Retorts the smoke nuisance "has been reduced to a mere fraction."

As regards variation in output at constant calorific value, this can readily be done on a Static Vertical Retort plant by varying combustion flue temperatures and cycle of operation, as in the case of an intermittent vertical chamber or horizontal retort. In a continuous vertical retort, variation of output is effected by varying combustion flue temperatures and rate of coke extraction.

In conclusion, the Authors would like to thank Mr. William Cash and Mr. F. B. Richards, the Chairmen of their respective Companies, for their kindly and encouraging remarks. They would further express their gratitude for the enlightened leadership which made it possible for them to be associated in what has proved to be a fascinating development in carbonization technique.

Installation of Tower Gas Purifiers

by

CYRIL M. CROFT, M.Inst.C.E., M.I.Mech.E., M.Inst.Gas E.

(Chief Engineer and General Manager, Wandsworth and District Gas Company).

Communication No. 212

Mr. N. Calvert (Nottingham) wrote: This Paper is very interesting as a preliminary report, but so far it appears to be too early to draw any definite conclusions as to whether it is possible to work up to 50 per cent. sulphur in the spent oxide with once fouling. I noticed that the two towers changed so far had 44 per cent. sulphur in the spent oxide, but it must be remembered that, when charged, tower 1 had 24 per cent. sulphur and tower 2 had 15 per cent. sulphur in the oxide. These results are little, if any, better than normal practice.

It would have been very interesting if these oxides containing 44 per cent. sulphur had been revivified and used again to see if they work efficiently when the sulphur content is in the neighbourhood of 55 to 60 per cent.

I should also like to have further details about the construction of the towers, especially the working arrangements of the valves for the reversal of flow of gas through the towers. With regard to the towers that have been emptied, were any tests carried out on the oxide from individual trays, for it would be interesting to know if they fouled evenly?

The chief advantage of the tower purifiers is, in my opinion, the short time required to change the oxide in a purifier. This is very important, especially when the purifiers are working under full load.

The Author's Reply.

Mr. C. M. Croft, in reply, wrote: Mr. Evans stated that he had experience some years ago of building an installation of rectangular purifier boxes at ground level, capable of dealing with 8 mill. cu.ft. of gas per day, at a capital cost of £45,000. This he considers to be proportionately equal in capital expenditure to the installation at Wandsworth. It should be pointed out, however, that the "10 mill. cu.ft. per day" of the Wandsworth installation is purely a nominal figure which was taken up for the purpose of design, but in actual practice it has been found that this installation can deal adequately with 13 mill. cu.ft. of gas per day, and therefore it is reasonable that comparisons should be made on this basis. This would have the effect of reducing the capital cost per mill. cu.ft. per day of tower purifiers to a figure which would be less than that represented by the installation mentioned by Mr. Evans.

It should also be borne in mind that costs in 1938 were considerably higher than those ruling during recent years, and allowance for this fact should also be made from Mr. Evans's figure.

Mr. Evans also suggests that it might be advantageous to operate a stream of gas in six purifiers with Nos. 1, 2, 3, and 4 working in backward rotation, while Nos. 5 and 6 remain as catch boxes. Actually this method of working the purifiers was not considered desirable, nor were the connexions designed for this purpose, as the practice at Wandsworth is to keep all the vessels active by periodic swinging, experience having proved sometimes that two boxes being left merely as catch boxes are apt to become inactive owing to absence of duty. Further, Mr. Evans will with his great experience agree that a box containing bog ore mixture could not be used as a last and final catch box.

The figures quoted by Mr. Pearson for the process of purification ruling at Birmingham are extremely interesting, to such an extent that I feel that it would be of general interest to the Gas Industry if the details of what is included in these costs could be furnished. It would appear that the particularly low figures given by Mr. Pearson may relate to one specific set of purifiers, as it will be noticed from the last Edition of "Field's Analysis" that the purification costs at Birmingham show a figure of 0·021d. per therm.

Mr. Pearson was also kind enough to quote some capital costs of an installation in 1928 which would raise the figure in comparison with Wandsworth to £66,000, which is higher than the cost of the tower purifiers for an equal capacity; but again it must be reiterated that the installation at Wandsworth is capable of dealing with 13 mill. cu.ft. of gas per day, and therefore Mr. Pearson's comparison should be modified accordingly.

The answer to the question regarding the back pressure thrown by the Wandsworth plant in operation is that the process back pressure on six towers is 7·5 in. w.g. on 10 mill. cu.ft. per day.

Mr. Shadbolt's figures and data as regarding an installation designed by him and erected some years ago were most interesting, but he admitted that in the case of these purifiers space was not a primary consideration, and therefore the boxes were made comparatively large for the duties for which they were designed.

Mr. Shadbolt also pointed out that although he could work his boxes for a period of two years, he preferred to work them for a period of 18 months in order to avoid discharging and refilling during the winter months. Owing to the ease with which the towers can be changed, the period of the year at which this incident occurs is of very little import. The reason for the first tower purifier being discharged prior to Christmas was that as this was the first of this kind of operation, it was actually in the form of a final test of the auxiliary machinery, and it is obvious that this test would be made under great inconvenience during the holiday period, when trained observers were required to be present.

With regard to Mr. Francombe's question concerning the saving of ground effected by the installation of tower purifiers, it is difficult and indeed impossible to place a value on this ground in terms of money, as, for the reasons stated in the Paper, the site of the Wandsworth Works is an ideal one, facing the River Thames. It is already surrounded by buildings, and additional scheduled land in this locality would be impossible to obtain; future developments must therefore be concentrated in the existing space.

With reference to the question whether electrostatic towers would have been installed at Wandsworth if other types of purifiers had been substituted for the tower purifiers, this is answered by the fact that the electric detarrers were installed before any further extension of the existing purifier plant was considered, and actually the extension of the purification plant would have had to be made earlier had it not been for the assistance given by the detarrers.

Mr. Dyde's questions were directed towards the temperature control of the tower purifiers as installed at Wandsworth. Naturally the temperature control of this plant was very fully considered when the designs were being prepared, and methods of preheating the gas were provided by (*a*) dry steam radiators, and (*b*) live steam which could be admitted as and when required and to a quantity which is subject to fine control. During the cold period of last December, no difficulty was found in maintaining a satisfactory temperature within the purifying towers, and indeed the heavy load at this period provided a sufficient heat due to reaction to overcome any cooling effects of the low atmospheric temperature. It is also interesting to note that in the few warm days which have been experienced this year, the temperatures have risen as high as desirable, and therefore it may be assumed that neither lagging nor housing is necessary or desirable, providing alternative methods of internal heat control are available.

Mr. Dyde also points to the fact that the whole of the added air is admitted to the inlet gas, and enquiries whether it would be considered preferable to admit air only to such towers as tests show are revivifying rather than passing it also through those that are absorbing. This point also was very closely discussed in the preliminary conferences before approving the final design of the plant, and it was clearly pointed out then, by Bamag-Meguin A.G., that it was considered better practice to admit a limited amount of air on the inlet gas and let those vessels absorb it through their

chemical condition which were capable of doing so, and this has proved as efficient as expected and easy to control.

Mr. Dyde further questions whether, with the increased mechanization, there is going to be an increase in maintenance costs. It is not admitted that there is increased mechanization, the only working part being the overhead crane and the lifting frame, which are considered to require only nominal maintenance and to compare favourably with the conveyors, transporters, and breakers required in alternative schemes.

With regard to the point as to whether the back pressure increased with the absorption of sulphur or due to condensation under cold weather conditions, it is gratifying to be able to report that no appreciable increase in back pressure and condensation in the oxide takes place under such conditions.

The mixture of 30 per cent. Lux and 70 per cent. bog ore was specified by the German designers in view of their having no direct experience on gases with a sulphur content as high as that in English practice, and experiments are to be carried out with gradual reduction of the quantity of Lux, now that it has been demonstrated that the plant has capacity for overload and is flexible. As regards the future, we are not bound by any preconceived ideas as to the nature or mixtures of any oxide which might be used, but it is considered that now the plant is in full working order, any good form of oxide would work satisfactorily, the original specification being one held to be desirable for starting up the plant.

Mr. Williams raises the question of storage of spent oxide. These mixtures are liable to fire if left for any unreasonable period after discharging, but this danger could be overcome by rendering the stocking tower air-tight and storing the containers of spent oxide in inert gas. In reply to his question regarding the reduction in oxygen in passing through the purifiers, the amount of oxygen on the inlet is maintained at 1 per cent. by the addition of approximately 3 per cent. of air and the residual oxygen in the outlet gas is usually 0·3 per cent. to 0·4 per cent., so that that absorbed by the reaction would be 0·7 per cent. to 0·6 per cent.

Mr. Gill asks if the complete internal revivification of the oxide had been considered. This most important point has been fully considered and the necessary connexions for such a process have been incorporated in the design, but it is felt that no known process is in existence at present which would not have the effect of increasing inerts to the town gas. The present method of partial revivification *in situ* requires extremely low power requirements, whereas the re-circulation system would involve heavy capital expenditure and working costs in dealing with the large volumes of air and gas that this process requires.

With regard to the question about the equal fouling of the purifying material throughout the boxes, this plant, by its mere design, is very adaptable for balanced flow through each layer of oxide. The theoretical considerations of the design indicate that any increase in pressure in one layer or part of one layer retards the flow of gas in that area and allows of an increased flow through the remaining layers, thereby averaging the sulphur deposited throughout the whole of the layers. This point was primarily of theoretical interest, but practical tests show that the theory of equal fouling is justified. On the first occasion that a box was discharged 56 samples of oxide were taken from various selected positions and throughout every tier of the tower, and the maximum deviation from the average of any one of these samples was not more than plus or minus 1 per cent. of sulphur.

No difficulty was experienced during the cold spell of last winter in keeping water from freezing in the exposed portion of the water valves, but, as a precaution, these were covered with lagging. This was a measure, however, which in actual practice did not seem to be necessary.

Mr. Stewart also raises the point as to whether the increased expenditure in providing reversing valves is likely to prove an economic financial proposition. It is regretted that, owing to the short time which these towers have been in operation, it is not possible to dogmatise on this point, although the designers of this plant were very insistent that this provision would be a wise one, and with this view we concur.

Mr. Currier deals with the point that the original allowance of 6·6 cu.ft. of oxide per 1,000 cu.ft. of gas per day was a liberal allowance in ordinary practice. I share this view with Mr. Currier, and the fact that the plant has already dealt with an overload of 33 per cent. proves it to be the case, but also proves that this plant is capable of dealing with the passage of as much gas as the oxide content of the vessels permits. With regard to purging plant, although not convinced that this is an absolute necessity, I feel that in the interests of safety it is highly desirable.

Mr. Currier also points out that in cases where the value of land is not a factor of prime consideration, cast iron rectangular boxes at ground level, with the simplest form of discharging machinery, are probably much cheaper from the point of view of capital cost. This may be so; but at Wandsworth, as stated in the Paper, conservation of the land was of paramount importance.

Mr. Calvert asks whether it is possible to work up to 50 per cent. of sulphur in the spent oxide with one fouling. The economical conditions prevailing at Wandsworth would show no advantage in revivifying oxide with 44 per cent. sulphur externally and returning it to the tower, but at the same time it is fully and confidently anticipated that 50 per cent. or more of sulphur can, and will be, obtained in these towers with one exposure.

Comfort by Gas Heating

Communication No. 211

by

L. W. ANDREW, B.A., B.Sc., M.Inst.Gas E.

and

A. BARRON

(Gas Light and Coke Company).

Mr. F. O. Hawes (Tottenham) wrote: The value of the information in this very detailed Paper is beyond question but I should like to draw attention to the figures for the costs of heating quoted in Table 9. The figures are, of course, strictly comparable since the gas costs are calculated from the determined thermal output of the coal fire. The consumption of this fire, however, in the light of experience at Tottenham and of general enquiry among acquaintances, is so large that it is thought that the table in its present form may be misinterpreted.

For example, it would appear that for a period of 13 hr. from the time of lighting the fire would cost 9·4d. indicating a consumption of 35 lb. of coal per day, while for 17 hr. the consumption is 44 lb. Actual domestic experiments at Tottenham showed an average consumption over 6 weeks of 27 lb. per day in the case of a room of over 1,500 cu.ft. capacity and 19 lb. per day in a room of about 900 cu.ft., in each case the daily period of use being 15 hr. from the time of lighting. It must be emphasized that an adequate degree of comfort was obtained in ordinary use, with these consumptions. In the larger room a temperature of 65° F. was maintained with outside temperatures in the neighbourhood of 40° F. These figures are so different from those of the Authors as to call for comment.

It is thought that any offer to heat a single room more cheaply by gas than by coal used at the rate of nearly 3 cwt. per week would carry little weight, since such a consumption of coal is not the practice of any ordinary household.

The Authors' Reply.

The **Authors**, in reply, wrote: We are very grateful to Sir Leonard Hill for emphasizing again the importance which

must be attached to the type of radiation emitted by a source of heat designed to provide the maximum comfort. It seems probable, especially in view of the remarks made later by Dr. Bedford, that we have far from reached finality in our knowledge of the effects of infra-red rays.

Whilst we are waiting for further information it is encouraging to know that recent developments in gas fire design have produced improved comfort, and also that the development of a fire giving the emission spectra of a coal fire will fall in line with the satisfactory experience of the ordinary person. It is possible, by means of gas, to reproduce almost any desired emission spectra, and we await with interest any further results which will guide us concerning the ideal requirements.

We are glad that Dr. Hartley is in agreement with the requirements for a really popular gas fire. He has also traced back the developments of gas fires which dispense with the formal column type of radiant. We believe, too, that the lines which Dr. Hartley discussed are the correct ones, but we should like to emphasize the importance of producing a fire which will as a minimum be satisfactory in capital cost and radiant efficiency, and have an appearance sufficiently attractive to the ordinary person who likes the appearance of a coal fire. Although attempts have been made in the past to develop along these lines, we do not know of any fire which has satisfied even two of these three requirements. We anticipate hopefully the development of any fire of the future which will help us in this problem. Dr. Hartley speaks of the possibility of an effective compromise between the imitation solid fuel fire and the fire of formal structure. We do not think there will be such a compromise as we feel there is an adequate field for both of these fires.

We regret that Dr. Hartley regards us as oscillating between gas at 4d. and gas at 6d. per therm, to compete with coal at 2s. 6d. per cwt. As mentioned at the opening of the Paper, the most recent results we have obtained from a district test give gas at 5·4d. per therm as competitive in price, and we feel that it is not possible to lay down any exact figure for comparison between coal and gas in the open fire, because this figure will depend so much on the user. We do say, however, that without doubt gas at 4d. per therm is considerably cheaper than coal at 2s. 6d. per cwt. and it is probable that gas at 5d. per therm will be definitely cheaper in practice; and under certain circumstances gas at 6d. per therm will be cheaper even for living room use. It is hoped that in the next year or so further practical figures will establish such a comparison more accurately.

Dr. Fishenden is probably our greatest authority on comfort in rooms heated by sources of radiant heat, and we are very interested in her emphasis on the importance of distribution of radiant heat. We agree entirely that geometrical distribution is a very important factor and we are playing for safety at the moment by considering a gas fire which gives distribution of radiation comparable to that from a solid fuel fire. We anticipate that in future the Gas Industry will provide distribution of heat which is better than that from a coal fire, and we hope that Dr. Fishenden will provide us with the necessary scientific information on which to base the new distribution of heat.

With regard to Dr. Fishenden's comments on the use of flueless gas fires in mild weather, we agree that it would be ideal to use a flued gas fire, but the flueless heater, at a comparatively low gas rate, would give satisfactory comfort at a very great saving in cost.

We had in mind in the Paper that frequently people are willing, for financial reasons, to accept reasonable comfort instead of ideal conditions.

Index of Comfort.

It is with the greatest diffidence that we suggest that Dr. Bedford is wrong when he disagreed with the statement in the Paper that there is not available a single index of comfort which allows satisfactorily for various environmental factors. We agree that under many circumstances either the resultant temperature, the equivalent temperature, or the globe thermometer temperature account satisfactorily for radiation, air movement, etc., but we had also in mind that none of these instruments measures satisfactorily the comfort of an occupant in a room heated by a radiant fire, *e.g.*, a coal fire. We have carried out tests with the eupatheoscope and this can register conditions which should be too hot, whereas the observer is definitely shivering at the back.

We feel that a new design of instrument is needed to deal with asymmetric radiant heating, which, after all, is the method normally used in the home.

With regard to the minimum desirable air temperature of 50° F., we agree that 55° F. would be a better temperature, but we felt that 50° F. was a reasonable starting temperature, bearing in mind that the air temperature would rise as soon as heating was commenced.

We were interested in the comments concerning the possibilities of high-temperature radiant panels giving cold feet and warm heads. We had anticipated some difficulty in this respect and recently one of us followed up personally a number of installations on the Gas Light and Coke Company's area. As a result, it appears that in practice—providing the heaters are fitted over 9 ft. from the ground—this trouble does not occur to any marked extent. In fact, if the heaters are alight for a short time before a factory is occupied then the radiation warms the floor and conditions are found to be very pleasant. We feel that any complaints which might occur would be due to inadequate heating or bad spacing of the panels.

We were interested that Dr. Angus could confirm from experience in the Provinces the immense possibilities of using gas at 4d. per therm in an all-gas house, and it is particularly gratifying that he finds such a figure satisfactory in houses in which the living room fire keeps the kitchen and living room warm and supplies the hot water and sometimes the cooker. It is our experience that attempts to provide cooking, water heating and space heating from the same appliance were unsatisfactory and uneconomical.

We are grateful to Dr. Angus and to Mr. Benton for drawing our attention to a serious omission from the Paper. We agree entirely that it is foolish to ignore gas lighting for factory heating and for domestic heating where economy is of major importance.

With regard to Mr. Benton's remarks concerning the possibility that our own work confirmed the amount of fresh air required to give healthy conditions, we are afraid this is a problem which we are not capable of tackling, and one which we would rather refer to Dr. Bedford, as he is an authority on such matters.

In connexion with the products of combustion, our own experience has been satisfactory but it is true that in large houses central heating would normally be considered as background heating.

Delight in Being "Hardy."

We, too, regret that people still take a delight in being "hardy" in their homes, but during a recent visit to some 150 people in their homes the impression was formed that this hardiness is not as real as people like to imagine. We are confident that once people appreciate the extra comfort which could be provided at a low cost then such an excuse will automatically disappear.

With regard to the stimulating effect of a hot water bottle, this certainly confirms the suggestion that one B.Th.U. is not as good as another, and has served to remind us, as was pointed out early in the Paper, that the general knowledge of comfort is sadly incomplete.

We are grateful to Mr. Toogood for emphasizing the merits of gas fires in infant schoolrooms, and we agree that there is everything to be gained by impressing on our potential customers at an early age that we have the modern fuel for the home.

We agree with Mr. Nobbs that controls are essential, but it was felt that too much room would have been taken up in the Paper if justice were done to them. In preparing the estimated costs mentioned, full automatic control has been assumed and for this reason we do not regard the figures as being too optimistic.

In reply to Mr. Currier, we confirm that it was by chance that the majority of the heaters in the installations mentioned are of the Wedge type. We are analysing as many installations of all types as possible, in order to arrive at approximate constants for use in preliminary negotiations.

It is felt that there is room for both the new type of inset

fire and the present design, and with the aid of tariffs a large additional load should be gained by the Industry.

In reply to Mr. Hart, we would point out that one of the difficulties experienced in producing this Paper was to obtain actual consumptions in domestic situations. This was due to the fact that, in nearly every case, gas for all purposes is supplied through one meter and it was decided that as personal habits play such a large part it would be unfair to attempt to estimate the amount of gas used for purposes other than central heating.

The figures Mr. Hart quotes are extremely interesting, and all will be well as long as he uses his figure of 27 cu.ft. per sq.ft. of heating surface only as a basis for calculation. It would be interesting to learn whether he has experimented with variations of this figure to suit individual jobs and what results he obtained.

Mr. Symonds will be interested to learn that when the Paper was first written, air conditioning was discussed at some length, but owing to lack of space we decided to confine ourselves to heating only, as a full discussion of conditioning entailed cooling as well.

In London, where space is of the utmost value, central plenum heating plants are not greatly used owing to the room they require and the high capital cost of installation. There is, however, a growing demand for individual plants, heating and/or conditioning each floor or section of a building, and in cases such as this, gas is the obvious fuel, as it is piped to the point of use, producing the maximum plant efficiency.

The elasticity of gas makes it a better fuel to use in a low-temperature panel system than any other, as in this type of plant quick control is necessary and other fuels react more slowly than gas. We thank Mr. Hawes, of Tottenham, for drawing attention to the possibility that Table 9 might be misinterpreted. This table is placed in the section of the Paper devoted to comparative running costs, and Mr. Hawes agrees that the figures form a satisfactory basis for finding the cost of gas per therm to be equivalent in running cost to coal at 2s. 6d. per cwt. The consumption of coal per hour was based on laboratory determinations of the amount of coal needed to maintain a small but attractive coal bed. In practice, over a long period, there will undoubtedly be times when the fire is banked to give a lower heat output with poor appearance.

It is pointed out in the Paper that if the fire is used intermittently and also with care in loading to prevent overheating then the case for gas is even better than the figures quoted indicate.

In the section dealing with estimated actual running costs the suggested usage of coal in a living room fire is given as about 2½ tons per year, or 1¾ cwt. per week. In the final summary a potential consumption for a gas fire in the living room is given as 200-300 therms, which would be equivalent to a coal consumption of 1¼ to 1¾ cwt. per week during the heating season.

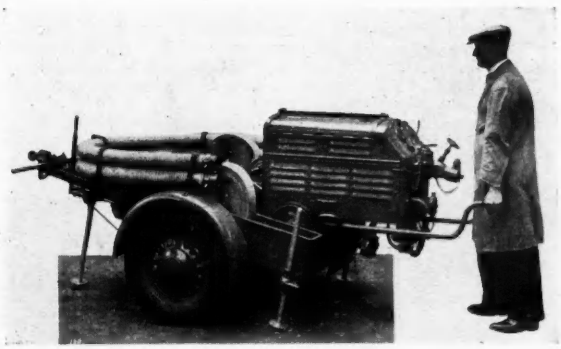
With regard to the section giving a practical comparison of coal and gas fires, an actual room being heated, about 26 lb. of coal were needed to give 10 hr. of comfort. This agrees as well as could be expected with Mr. Hawes's figure of 27 lb. per day in a room in which the period of use is 15 hr. from the time of lighting. It is, however, suggested that comfort was not maintained for anything like the full 15 hr. although it may well be that the conditions obtained would be accepted in practice. It will be appreciated, however, that it was necessary in our tests to maintain an exact comfort standard throughout the whole period of test.

It is certainly unwise to forecast the total amount of coal or gas that would be used in a living room. The figures for comparative costs can, however, be taken as reliable and the annual cost of heating a room by gas instead of coal might well be based on the consumer's estimate of the amount of coal that has been used in the past. If such a figure is not available then a gas consumption between 200 and 300 therms should be suggested and at the same time emphasis laid on the fact that the comparative cost of gas and coal is established.

TRADE NEWS

Beresford Self-Priming Pumps.

Many of our readers will be familiar with the Beresford-Stock self-priming pump illustrated in the accompanying photograph, for it is of a type widely issued in recent times for A.R.P. purposes. Indeed, well over four thousand of these trailer pumps have already been ordered by the Government—the majority for the Auxiliary Fire Services throughout the country. The model illustrated, which



is that most widely used by the A.F.S., is fitted with an Austin 8 engine, while a larger unit has a Ford V-8 engine. Both types are fitted with the Beresford patent exhaust vacuum primer which the firm have pioneered and which is now specified by the Government. They hold a certificate from the National Physical Laboratory in respect of 500 consecutive primings carried out at the maximum specified positional lift of 24 ft. without any adjustment or variation in priming time. Only 17 seconds is required on the average to prime these pumps for static supply work, while they are, of course, equally adaptable for raising the pressure from a hydrant supply.

The principle of priming is simplicity itself. The movement of the priming lever diverts the exhaust gas from the engine through a secondary exhaust pipe which is connected by means of a tube to the inlet side of the centrifugal pumping chamber. This draws the air out of the suction hose, allowing the water to rise up into the pump chamber. As soon as water is seen to be issuing from the secondary exhaust pipe, the priming lever is released and automatically springs back to the closed position. The pump is now drawing water and the outlet may be opened. As will be seen from the photograph, the pump can be dismounted from its trailer chassis and wheeled by hand or carried by means of the handles by four men.

Apart from their application for A.R.P. purposes, these pumps, of which there are various other models available, are suitable for ordinary industrial pumping operations. The units are fitted with an automatic cooling system having duplicate filters, while the main pump bearing is water-lubricated.

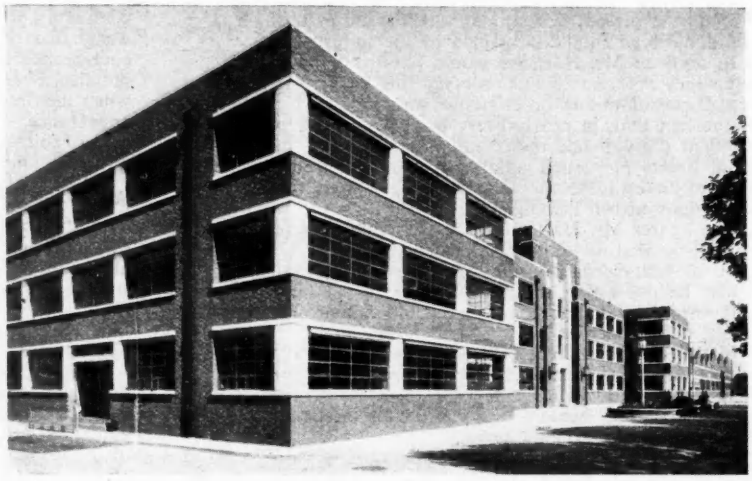
Compressors for the U.S.S.R.

Among orders recently completed by J. Browett-Lindley (1931), Ltd., of Letchworth, Herts., for compressors is a large contract for Machinoimport, U.S.S.R., comprising twenty-three machines—ten having a capacity of 4,000 cu.ft. per minute and thirteen of 2,100 cu.ft. per minute when delivering at a pressure of 120 lb. per sq.in. These machines are of the firm's standard two-stage, double-acting, crosshead type, and are arranged for direct coupling to electric motors. The former group is fitted with inter-coolers and after-coolers, while the thirteen smaller machines are equipped with inter-coolers only. We are informed that these compressors are to be distributed among large industrial concerns throughout the U.S.S.R.

It is interesting to note that the firm increased their compressor testing equipment some time ago (partly with a view to dealing with this order) by installing a vee-rope drive, which is now believed to be the largest of its kind in the world. The driving motor is 1,000 b.h.p. and is of the auto-synchronous type. Browett-Lindley compressors of the largest sizes can be tested under full load conditions with this equipment.

The compressors were built to the specifications of the Russian engineers, and thoroughly inspected by them before despatch.

ON a site exceeding ten acres adjacent to the L.N.E.R. main line at Tottenham, Messrs. Keith Blackman, Ltd., have opened extensive modern works and offices which, in conjunction with new manufacturing plant of the latest design, will afford greatly improved facilities for the production of their specialities, many of which are, of course, in constant demand throughout the Gas Industry. We were privileged the other day, in company with a number of representatives of the Trade Press, to make a thorough inspection of these very fine new buildings, and in the following article we describe and illustrate some of the many activities carried on there by this old-established firm.



The Office Frontage.

New Works for Keith Blackman, Ltd.

THE progress and development of Keith Blackman, Ltd., might almost be described as the romance of a great industry, and for that reason we feel that a few notes on the early history of the firm may be of general interest.

In 1823, George Keith, the great-grandfather of the present Chairman and Managing Director, established a small engineering business in High Street, Arbroath. This business was subsequently carried on by the late Ex-Provost George Keith until 1868. Up to this time the concern had prospered, but developments had been rather gradual. James Keith, the eldest son of Ex-Provost Keith, then took control, after having had valuable engineering experience in Canada and the United States. He was the inventor of numerous hydraulic, heating, ventilating, and other appliances, and was the originator of the modern type of sectional boiler for water heating.

The Blackman Air Propellor Ventilating Company, Ltd., was formed in 1883, with offices in the City of London and Works in Holloway, and this concern pioneered the propellor type of ventilating fan, to which at this time its efforts were exclusively devoted. It was successful right from the start, and in November, 1900, by which time its name had been changed to the Blackman Ventilating Company, Ltd., James Keith's business was amalgamated with that of the Company under the style of James Keith & Blackman Co., Ltd.

Extensions.

In 1901 and 1902 increasing business necessitated extensions to the foundry at Arbroath, and from that time up to now the history of the Company has been one of continued progress. The development of high-pressure gas lighting by Mr. George Keith, the present Chairman and Managing Director, was a great step forward, and at the same time the Company began to develop a business in high-pressure blowers, gas boosters, &c., following which came the invention of the "Keith" centrifugal fan—now well-known all over the world.

Just prior to the war the Lordburn Works at Arbroath were built, covering 2½ acres, while considerable extensions were made at the Holloway Works—where a new three-floor building was erected in 1927. Two years later further extensions and new buildings embracing about 1½ acres were made at Applegate, Arbroath, while in 1935 a new iron foundry for light machine moulded castings was completed. As an indication of the progress of the concern, it may be mentioned that in 1901 the capital was £90,000; in 1907 it was increased to £130,000; in 1920 it was increased to £250,000, while in June, 1937, the capital was further increased to £500,000 (paid up, £400,000). The Company's reserves amount at the present time to £150,000.

THE NEW WORKS.

The total number of people employed at the new Tottenham Works is 1,200, and in every part of both offices and works the consideration which the management have given to comfortable working conditions and general welfare of their staff is patently clear—from the up-to-date canteen where meals can be provided for 650 persons at one sitting to the bright and airy workshops and offices, warmed and ventilated throughout by the most modern systems. The accompanying photographs indicate far better than the written word the full significance of this statement.

It will be appreciated, of course, that all the firm's foundry work is done at Arbroath, so that the processes carried out at Tottenham consist principally of assembling, finishing, testing, and despatching, though a considerable amount of small fittings are made here on up-to-date machines.

To deal with some of the special departments of the works, it may be mentioned that in the Balancing Department there are four dynamic balancing machines on which can be balanced multivane fan runners, armatures, rotors, from 1 oz. in weight up to 2 tons, and six balancing tables for balancing streamline runners of any size from 6 in. up to 96 in. diameter. With dynamic balancing machines there is no vibration, which means longer life and less wear and tear on the bearings of the machine.

In the Impregnating Room the heating is thermostatically con-

The Board Room.

One of the Offices.

trolled. Permanent temperature records are kept by recorders, and after the articles to be impregnated go in for final baking, the ovens are automatically controlled by synchronous time clocks.

Two methods of impregnation are employed—the hot dip and bake method and the ordinary vacuum impregnation.

The Electrical Test Shop is equipped with the most up-to-date plant for testing blowers, boosters, turbos, and motor-driven fans. It is possible in this shop to test 200 machines at one time.

Over 20,000 electric motors are produced a year for direct coupling to fans, blowers, compressors, &c.

In one corner of the Painting and Spraying Shop there is a separate compartment in which cellulose paint spraying is done, the fumes being exhausted by a "Blackman" streamline fan, through wood-wool filters. The incoming air is warmed, when required, by copper gilled tube radiators fitted.

In addition to their well-known lighting units, Keith Blackman produce at these works a number of other appliances of interest to the Gas Industry, including gas irons of various types, internally-heated soldering irons with a special device to prevent oxidation of the tip, gas burners, boosters, compressors, and, perhaps the most extensive of their gas business, equipment for baking ovens, including different types of burners for static and travelling ovens, thermostatic controls, governors, &c., as well as fans and filters for the introduction of clean air to the burners—a very important point in the modern bakery.

The "Magnalux" lighting units are tested at these works, and an ingenious wind tunnel has been devised for testing the lamps' resistance to wind pressure as well as sudden blasts.

Both gas and electricity are used for lighting the works—Keith high-pressure gas lamps for the general lighting and electric lamps for the individual lighting of the machines. Outside lighting in the yards and roadways between buildings is provided by Keith high-pressure lamps suspended from bracket arms on the adjoining walls, together with "Magnalux" low-pressure lamps with the patent Keith raising and lowering gear from colums and bracket arms. Gas is also used to a considerable extent for various purposes on the works, particularly for soldering in the electric motor assembly shop, and for water heating in the canteen block. Coke-fired boilers are also in use. Needless to say, all the cooking equipment in the canteen is heated by gas. Two types of service are provided in the canteen—a waitress service for the executive staff and a cafeteria service for the workpeople. Adjoining the main canteen is the Directors' dining room.

All the electricity for actual works production requirements and the fluctuating demand for current for testing large blowers, boosters, turbos, and motor-driven fans is provided by six diesel engines and generators in the firm's own power house, without any outside assistance. The power house is a very fine example of its kind, and has an outside wall running alongside the railway siding so that fuel supplies can be taken direct from tank wagons.

Heating and Ventilating Systems.

Particular attention has been paid to the heating and ventilation of the buildings. The office block is served by a balanced system of inlet and exhaust providing six air changes per hour in

Lighting and Industrial Gas Heating Department. Examples of Keith Blackman "Magnalux" Gas Lamps can be seen on test in this photograph.

the summer and four in the winter, exposure losses being dealt with by direct radiator warming. For winter conditions the system is designed to maintain a temperature of 65° throughout the offices with an outside temperature of 30° F.

The heating system is an accelerated hot water type, utilizing cast sectional boilers fed by underfeed stokers. Radiators of the "Classic" column type and wall types, with "Ray-rads" in the private offices and Board Room, deal with the building exposure losses.

The air for ventilation is drawn by "Keith" multivane fans of the latest pattern, into an air treatment plant through "K.B." "throw-away" pad filters, a "K.B." copper gilled pre-heater, "K.B." spray type double bank washer chamber and final heater—also the "K.B." copper gilled type. The plant is automatically controlled, for winter conditions only, by means of thermostats and magnetic solenoid valves, so arranged as to control the dew point and final condition of the air entering the building.

The main heating system is also controlled by means of a master thermostat in the building which operates magnetic valves at the boilers, and each of the private offices and the Board Room have individual thermostatic control with magnetic valves which can be set to the individual requirements of the occupier.

The fans discharge the air into ducts formed in the building construction, the air being conveyed to the various floors via ducts formed in the stanchion casings in the external walls, and finally entering the various rooms through grilles at high level.

Light Fitting Shop.

The exhaust ventilation generally throughout the offices is by means of ducts formed over the central corridors of the building, whence it is taken up via two main exhaust ducts on either side of the central staircase and round central stanchions in the North and South Wings to fans situated in chambers on the roof of the building. These fans also are "Keith" multivane fans.

The lavatories in the office block are provided with an entirely separate exhaust system, with fans in duplicate arranged to exhaust fifteen air changes per hour from the lavatories and cloakrooms.

Hot water for the use of the staff is supplied by means of a sectional boiler also fed by means of an underfeed automatic stoker which is, with the boiler, directly connected to a vertical cylinder of 450 gallons capacity. The water for this domestic supply is passed through a water softening plant.

The heating of the works is done entirely by means of "K.B." unit heaters, using hot water as the heating medium, and each unit is fitted with an adjustable nozzle to ensure the air being discharged reaches the working level. The units are slung from the steel framework of the saw-tooth roof, having fresh air and re-circulating inlet ducts fitted, and are capable of giving two air changes per hour.

Accelerated Supply.

As in the case of the office block, the system is an accelerated hot water type, utilizing Super Economic boilers with automatic stokers, the stoker hoppers being fed with fuel from an overhead coal bunker constructed in reinforced concrete and having a capacity of 250 tons, the feed from the storage to the boiler hoppers being by gravity. A conveyor is fitted to transport the coal from railway trucks and distribute the coal along the length of the bunker.

The power house is provided separately with an air inlet plant, consisting of four "Blackman" streamline fans, the inlet side of each being fitted with "Keith Blackman" "W" type oil-film filters and copper gilled heaters for tempering the air in winter. This inlet equipment is capable of providing up to fifteen changes of air per hour in this chamber. Similar fans are situated in the outside external wall to exhaust air at the same rate.

Arrangements of air inlet and exhaust for the electrical test shop are similar to those provided for the power house to ensure

that the air entering shall not be dust-laden, the filters in this instance being of "K.B." standard vertical fixing oil-film type.

The lavatories being situated internally in the building, fresh air is supplied to them through a vertical duct carried down from the roof, the air passing through "K.B." heaters for tempering in the winter, and via grilles under the washing troughs at low level. The lavatories are also provided with duplicated exhaust fans of the streamline type to maintain twenty changes per hour.

The main restaurant is supplied with air at the rate of four changes in the winter and six changes in the summer, the air being filtered and warmed. The filters are "K.B." horizontal pattern or "W" type "throw-away" pad filters; the heaters are of the "K.B." copper gilled tube type.

As in the case of the main office block, the air is distributed through grilles in the stanchion casings via ducts constructed in the building. The air is exhausted from the restaurant by means of No. 3 type "Blackman" volume fans mounted in the gable ends of lantern lights in the roof of the restaurant.

Building exposure losses are dealt with by means of "Classic" type radiators connected to the main works' heating installation.

The main kitchen and wash-up exhaust ventilation is by means of No. 3 type "Blackman" volume fans, giving 20-25 air changes per hour.

The whole of the water supply to the kitchen is passed through a water softening plant. Two 4-section "K.B." gas-fired boilers, the total capacity of which is 320 gallons per hour at 140° F., provide all the hot water for the canteen.

Among the sub-contractors for various equipment throughout the new premises the following may be mentioned:

Office Boilers: Ideal Boilers and Radiators, Ltd.; *Pumps:* Holden & Brooks, Ltd.; *Works Boilers:* H. & T. Danks (Netherton), Ltd.; *Erection of Office Hot Water Boilers and supplying and fixing of Hot Water Mains:* Norris Warming Company, Ltd.; *Mechanical Stokers:* James Hodgkinson (Salford), Ltd.; *Conveyors:* Redler Patents; *Kitchen Equipment:* Benham & Sons, Ltd., R. & A. Main, Ltd., Davis Gas Stove Company, Ltd. (Radiation, Ltd.); *Kitchen Equipment Installation:* Tottenham & District Gas Company; *Diesel Alternator Plant:* Crossley Bros., Ltd.; *Electrical Motor Equipment:* Brook Motors, Ltd.; *Electrical Switchgear:* Allen West & Co., Ltd.

The Architects responsible for the design of the new Works and Offices were S. Clifford Tee & Gale (153, Moorgate, London, E.C. 2).

Athletic and Social

One Run Victory.

In a game at Deal, the Canterbury Gas and Water Company's cricket team beat Deal and Walmer Gas Company by one run, the scores being 124 and 123.

Sheffield's Tennis Team Undefeated.

With half of the season's matches played, Sheffield Gas Company are the leaders of the fourth division of the Sheffield Parks Tennis League, and there is a general confidence that the team, which entered the League only this season, will move up to the third division next season. So far the team has not lost a match.

Cardiff A.C. "Double."

The return match between the Cardiff Gas A.C. and the Cardiff Technical College A.C., at the college grounds, resulted in an easy victory for the visitors, who fared even better than they had previously done at Grangetown, where the margin between the sides had been the narrow one of six points. The visitors won every event to triumph by 20 points. Scores: Cardiff Gas A.C., 35; Cardiff Technical College, 15.

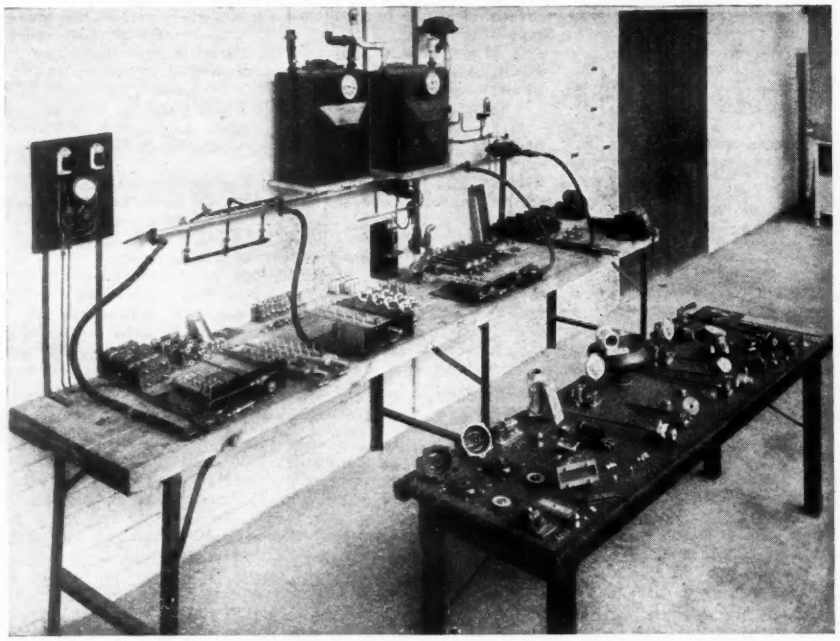
Canterbury Staff Outing.

The Annual Outing of the Canterbury Gas and Water Company's staff and employees took place on June 24 and July 1, and proved as popular as ever. The programme included breakfast at Chatham, and a sea trip to Southend where lunch was partaken of. The afternoon was left free for all to find their own amusement, the party meeting again and taking the boat back to Chatham for high tea, followed by the second house at the Royal Hippodrome. The outing was favoured with fine weather on both occasions.

South Metropolitan Coal and Shipping Sports.

Rain interfered with the annual sports of the South Metropolitan Gas Company's Coal and Shipping Department, Newcastle, which were held at the Y.M.C.A. Recreation Ground, South Shields, on July 8, and, after many stoppages, the events were continued in the big marquee. There was a big entry, particularly for the childrens events, which are always a feature. The Tug-of-war Challenge Cup was won by South Shields Old Charlton, who defeated Newcastle office in the final. Newcastle office was also second in the Novelty Team Race, which was won by South Shields Redriff. The prizes were presented by Mrs. R. Wilson.

THOMAS POTTERTON (HEATING ENGINEERS) LIMITED



A view of the testing bench for controls and other accessories

We Invite

visits to our new Works by Principals and Representatives of Gas Undertakings for the purpose of demonstrating the efficiency of our product and for instructions in maintenance when the design and adjustment of thermostatic controls, automatic gas cut-offs and allied equipment can be fully explained with demonstration sets in operation.

An inspection by appointment will be esteemed

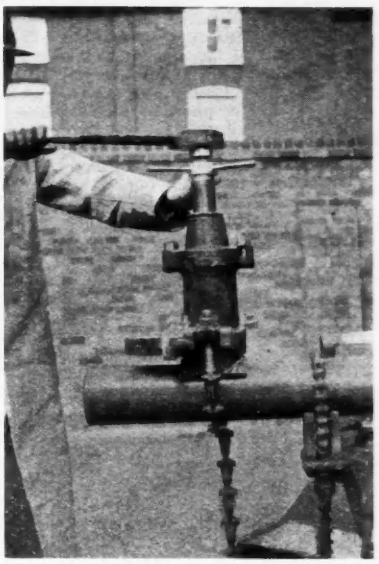
CAVENDISH WORKS, 20-30, BUCKHOLD ROAD, WANDSWORTH, S.W.18

Telephone: PUTNEY 2263-4-5 Telegrams: POTTERTON, PUT, LONDON.

Rapid and Effective Method of Connecting Services Under Pressure

Expanding the Nipple into position on Low-Pressure Supply.

With a number of Gas Engineers from the Gas Consolidation and Severn Valley Groups we witnessed a very interesting demonstration recently at the works of the Kidsgrove Gaslight Company of an effective method of fitting service connexions to gas mains under pressure without the necessity of tapping the mains. This development is the result of research and experiments by Mr. A. S. Foster (Managing Director, Engineer, and Secretary of the Stourport Gas Company), who, before demonstrating the insertion of nipples in a spun-iron pipe, gave a *résumé* of the reasons why this new type of connexion came to be introduced.



Showing the Type of Drilling Machine for High-Pressure Mains.

IN May, 1937, Mr. G. M. Gill inaugurated a number of experiments at various works, with the object of obtaining a more reliable joint for the connexion of services on to spun pipes. He set out the facts that the Gas Industry now has gas mains, particularly in spun pipe, capable of being laid to stand any reasonable high pressures; services were satisfactory, but the weak link in the chain was the connexion between the service and the main. Owing to spun pipes having appreciably thinner walls than pit cast pipes, there was greater difficulty in making reliable screwed service connexions in spun pipes even for low pressure.

A letter from Mr. G. M. Gill, written about this date on the question of modifying the existing "Du-Ex" nipple as used for steel pipes to make it suitable for use with spun pipes, stated:

> "The successful use of this type of joint for service connexions to be used with spun pipes is very important because we have no satisfactory method of making service connexions, especially to the smaller spun pipes, as it must be borne in mind that on some future date it may be desirable to use such mains originally laid for low pressures for much higher pressures. I am accordingly anxious that we should standardize a type of joint which would be satisfactory for, say, 10 lb. pressure."

There have been great changes in the last 25 years in the manufacture of pipes for gas, and water mains. The old cast iron pipes which were chiefly made in 9-ft. lengths vertically cast have gradually given way to steel mains and spun pipes, although many ordinary cast pipes are still used.

With the development of steel and spun pipes for high-pressure gas, and also owing to the severe traffic conditions prevailing on the roads to-day, great attention has been paid by manufacturers of pipes, to put on the market various types of joints for their pipes, to enable them to stand up to high pressure under modern road conditions. The various manufacturers have been successful in producing gas-tight mains to stand high pressure and also the shock of modern traffic.

Corrosion of Services.

Turning to the question of services, no serious trouble has been experienced in recent years in laying services capable of standing up to any reasonable pressure. The chief trouble has been due to corrosion—not leaky joints.

On the introduction of steel mains some years ago a great deal of thought had to be given to this problem of service connexions because of the thinness of the wall of a steel main, as against cast iron. While the wall of a cast-iron main could be threaded, and so obtain a screwed joint tight for towns pressure, it was next to impossible to do so with a steel main using standard threading, particularly if the steel main were of small diameter. This set of conditions resulted in the development of the Parkinson joint, which had a nipple with one bead, and that internal.

After the Parkinson joint came a further development—viz., the "Du-Ex" nipple, with two internal beads—and this has been the joint almost universally used for connexions off steel mains in recent years. With a steel main, using standard "Du-Ex" nipples, it is possible to insert connexions with a tolerable degree of accuracy as far as the positioning of the beads is concerned; and even if the positions of the beads were not strictly correct the process of expanding caused no trouble due to the fracturing of the steel mains, owing to the physical properties of the steel itself.

Modified Nipple for Spun Pipes.

The question therefore arose as to whether it would be possible to modify the "Du-Ex" nipple for use with spun pipes. For over a year experiment after experiment was carried out, as a result of which it was found that to use this design of nipple with spun pipes was a different proposition. It was, of course, obvious from the beginning that in fixing this type of nipple in spun pipes—which have the properties of cast iron—the positioning of the beads of the nipple must be exact. If either bead is opposite the wall of the pipe, the pipe may split, due to the physical properties of cast iron as against steel.

The two beads in nipples for use in spun pipe must, of course, be wider apart than is the case with those for steel pipes, due to the difference in thickness of spun pipe as compared with steel. This was easily arranged for.

The next point to consider was the type of thread on the nipple which screws into the gas main. It had always been standard to use a fine thread on "Du-Ex" nipples for use with smaller steel mains. This would not do with spun pipes. Cast iron will not stand up to fine threading, as was proved by examination of tappings actually carried out, the threads were often ripped. The coarser thread—*i.e.*, the British Standard Pipe Thread, which is based on the old Whitworth pipe thread—had to be adopted, for the following reasons:

1. Ripping of cast iron with fine threads.
2. Lack of strength in fine thread in cast iron.
3. If threads were perfect, they would have little strength as compared with B.S.P.

Thus the point was reached where it was settled that "Du-Ex" nipples for spun pipes must embrace the following points:

1. The two internal beads must be positioned immediately above and below the wall of the spun pipe.
2. The thread of the nipple screwing into the spun pipe must be B.S.P.

It was found that this was an ideal almost impossible to attain even on the test bench, and especially so under conditions under

which service layers of gas undertakings are used to working. From actual experiments it was found that when working with threaded nipples which showed only a few thousands difference in their diameter from the diameter of the drill taps used for drilling and tapping the main, there was an error in the position of the nipple of fully ¼ in. This is the width of a full bead and quite sufficient to cause a burst main if the expansion came opposite the wall of the pipe. They were thus between the two evils of screwing in the nipples too far or not screwing them in far enough. The close investigation of screw threads which all this work entailed emphasized the fact that in the engineering world the screw thread which is seen everywhere is a most difficult thing to make perfectly. It can vary in so many ways, and when one considers the many combinations of the variations the problem appears to leap out of bounds.

Mr. Foster recommends *Gas Fitting Part* 9—Notes on Screw Threads used in the Gas Industry by S. F. Dunkley and R. N. Le Fevre—to all those who would like to go deeper into this question. This booklet is published by the "GAS JOURNAL."

Thus it would be appreciated that the great difficulty was to screw the "Du-Ex" nipple into the main as far as it would go to ensure the threads being tight, and yet leave the beads correctly positioned for expanding above and below the wall of the spun pipe. This was not a practicable proposition, and it was almost decided to allow a certain tolerance and depend on the expanding of the beads to give the final "tighten up" to the thread. This position was reached in May, 1938.

Threads Unnecessary for Pressure Joints.

Mr. Foster observes that he now arrived at the day when he was casually watching a stoker cleaning out the tubes of a Cochran boiler. This boiler works at 100 lb. per sq.in., and the majority of the tubes are plain and expanded into plates front and back. The question arose in his mind of whether a thread was necessary for pressure joints. It was obvious that it was not. The following morning the idea came of having a nipple with an external bead to fix the position and take any weight from above, a slight oversize to give the tightness which is obtained in a boiler with an expander, and one external bead to rivet the nipple in position. The whole thing seemed too simple to be practicable. Further consideration pointed to a downward expansion of the bead as being the correct thing to do, as this would further tighten the nipple during the operation, keeping the external bead tight on the exterior of the pipe in doing so.

These are the chief points of the "Un-Ex" nipple. It was obvious, after all the experimenting with screw threads previously alluded to, that from an engineering point of view, it was a simple matter to drill a pipe with a plain hole correct to fine limits and also to make a threadless nipple correct, also to fine limits.

Now followed a rather anxious time in developing the tools for performing the operation of inserting and securely fixing these threadless nipples. The first tools were crude, but very important spade work was done and important points mastered step by step by means of the first tools, and these points are now embraced in the tools obtainable for inserting and securing these nipples easily, safely, and quickly.

Naturally, as a very large percentage of gas undertakings' work is at ordinary town pressure, the question of mastering this part of the business came first, although, all the time, the question of high-pressure work was in the background. It became obvious that if the connexion was to become a success, existing apparatus possessed by most gas undertakings for drilling and tapping mains must be made use of.

A firm who have had many years' experience in drilling apparatus for gas mains (Messrs. E. Pass & Co., of Manchester) was therefore approached and by pooling their experience in this class of work, with knowledge gained from the experiments, existing machines were modified to carry out the necessary operations.

Development of Low Pressure and Dead Main Work.

The first problem which had to be tackled was the drilling of the gas main with a hole correct to certain limits. For this work a special combined drill-reamer instead of the usual combined drill tap was ordered. The drill does the greater part of the work; while the reamer finishes off the hole dead to size. Incidently, the reamer has only to take off a few thousandths, so its life is long compared with the drill bit, which, being detachable, can be renewed. It is recommended that these drill-reamers be kept in special leather pockets to protect the flutes of the reamer. The head of the drill-reamer, being of the same fitting as the head of a drill-tap, will fit the existing machines possessed by many gas undertakings. The use of "GO" and "NO GO" gauges is advocated to check up the diameters of the holes made by drill-reamers, which will be supplied to the Industry. These in all probability will be supplied by the makers of the "Un-Ex" nipples and will ensure that the correct amount of tolerance is being ahered to.

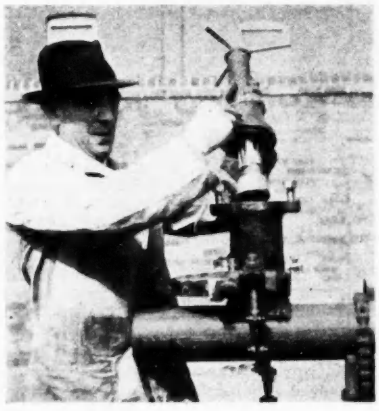
The first operation—viz., drilling the main correct to size—presented no serious difficulty. The next problems were the insertion of the nipple up to its exterior bead, determining the amount of oversize required to give the compression required, and finally the expanding of the interior bead.

A hollow tool and a lump hammer was first used for fixing the nipples, and a plain taper expander with a lump hammer for expanding the beads, the expander being provided with a hole near the top in order to ease the expander with a tommy-bar after the operation. This latter tool was soon dispensed with in favour of a screw expander, which easily withdrew the expander, even when wedged most tightly.

It soon became obvious that if the nipples could be pressed in gently and expanded similarly a great step forward would be made. The result was the development of a second chuck to suit existing drilling machines as used by many gas undertakings. This chuck is designed to take adaptors for any sized nipple from ½ in. to 2 in., and the screwed expander mentioned above was incorporated as part of the tool. Further, the existing screw in the bridle of the drilling machine was made use of to force down the nipples into position, and later to give the necessary pressure to force down the expander to expand the bead.

This low-pressure apparatus is most successful, and as soon as it was properly working, it was possible to ascertain from actual experiments the correct amount of taper and oversize of the spigot to give the required results.

The downward method of expansion has enabled the problem of inserting and expanding the "Un-Ex" nipples in high-pressure mains *under pressure* to be most successfully accomplished. The secret of success depends on the fact that with this method of expansion there are no expansion tools locked in the nipple to foul other operations being carried out. The removal of the swarf lying on top of the main after the drilling operation is easily effected by means of a powerful magnet.



The circular magnet being inserted to extract the swarf after drilling the main.

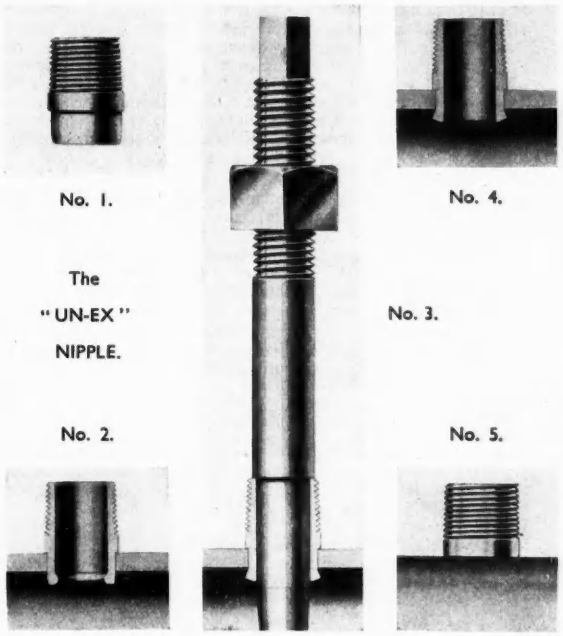
After the fixing of the high-pressure apparatus on to the main, the main can be drilled and all operations carried out up to fixing the nipple and gas cock ready for running the service (up to 1 in. diameter) in less than half an hour.

A Demonstration of the Procedure.

A demonstration was subsequently given of drilling a main and inserting and expanding the nipple under low-pressure and high-pressure conditions. The different apparatus required for the two separate jobs are illustrated in the accompanying photographs.

The procedure with low-pressure supply is as follows: The central action drill stand is fixed on to the top of the main and the chuck holding the drill-reamer inserted. When the main has been drilled and the hole reamered, the swarf is removed by means of the powerful magnet previously referred to and the hole brushed round while a cover-plate through which the brush spindle passes protects the operator from escaping gas. The nipple is now screwed home into another chuck and the expander mandrel dropped down the centre of the chuck. The nipple is forced into the main by screw pressure, a hand wrench turning the screw in the bridle, which transmits the pressure to the mandrel. The pressure is further transmitted from the mandrel to the nut, from the nut to the chuck, and finally from the chuck to the nipple. The pressure is now eased for a moment and the large extractor nut run up to its top position preparatory to forcing down the expander. As the expander is forced down through the nipple the latter becomes knit against the walls of

the main, while the bead around the lower edge of the nipple is pushed outwards under the walls of the main, thereby effectively locking the nipple in position. The bridle is then released and



1.—The "Un-Ex" Nipple.
2.—Section of Nipple before expansion.
3.—Process of expansion.
4.—Section showing Nipple expanded.
5.—Nipple ready for service connexion.

the extractor nut turned slightly to ease the expander, which may now easily be withdrawn. The job is now completed, and the drill stand is removed from the main and the nipple capped off. The whole operation on a low-pressure main can be completed in as little as fifteen minutes.

For high-pressure work a special high-pressure drill stand is employed. This embodies a gate which is closed to shut off the gas when taking off the head of the machine to change the tools in the course of the various operations. Apart from this the general procedure is very much the same as for a low-pressure main, save that a stopping-off plug has to be inserted through the machine into the female thread inside the nipple before the machine is finally removed from the main. A special ferrule cock is then screwed on to the outside male thread of the nipple and the plug withdrawn from the nipple and screwed into the ferrule with a special tool.

The "Un-Ex" Nipple.

A brief description of the "Un-Ex" nipple may be of interest. Reference to the diagrammatic illustration (No. 1) will show that the top portion of the nipple is threaded to make the service connexion. At the bottom of the thread there is a shoulder which sits on the outside diameter of the main, while a plain shank, slightly tapered to assist it to enter the reamered hole in the main, but increasing in diameter up to the shoulder, enables an interference fit to be made. At the bottom of and inside the plain shank is an integral bead (No. 2).

Through the agency of the special accessories already described, the nipple is forced into the reamered hole until the shoulder rests on the outside wall of the main; this makes a gas-tight and water-tight connexion. The mandrel is then passed downwards through the nipple, and the integral nipple expanded downwards and outwards, hard against the inner wall of the main (Nos. 3 and 4). The mandrel is then released, and the connexion to the main is ready for the service pipe to be attached. A reliable joint is made without damage to the main and one that will withstand even greater pressure than the main itself.

After the demonstration, Mr. A. J. COUZENS, representing J. Stone & Co., Ltd., of Deptford, the makers of the "Un-Ex" nipples, thanked Mr. Foster for the opportunity of watching the process and Mr. R. Beech (Manager and Secretary of the Kidsgrove Gaslight Company) for the facilities provided for the demonstration. It was interesting to note, he observed, that Messrs. Stone & Co., Ltd., were the original manufacturers thirty years ago of the Woodall-Parkinson nipple embodying a single J. Stone & Co., Ltd., of Deptford, the makers of the "Du-Ex" with two expanding beads—one inside and one outside the main.

The National Gas Association of Australia's Badge of Approval.

The Certification of Gas Appliances

By JAMES HARRISON,

Deputy President and Secretary, the National Gas Association of Australia.

ANY scheme which aims at the general improvement of gas appliances is a matter of importance. Although the standard of gas appliances in England appears to be relatively high, the fact that the question of their certification is raised there from time to time would appear to indicate that there exists some need for such a scheme. It might, therefore, be of interest to your readers to obtain some idea of the scheme instituted several years ago and conducted by the National Gas Association of Australia. As this scheme differs in some important aspects from those in operation in other parts of the world, this information may, perhaps, have an added interest.

The need for the scheme rests on the following fundamental propositions:

1. That the purchaser of a gas appliance is entitled to know that it is safe, efficient, and of durable construction.
2. That gas undertakings should be in a position to know readily what appliances are reliable, just as the hallmark easily distinguishes gold and silver from dross.
3. That, as gas appliances stand between ourselves and our consumers, the progressive welfare of our Industry must always be inseparably bound up in them. It is reasonable, therefore, that the Gas Industry should have some instrument of control in respect of gas appliances.

The need for a scheme is, of course, commensurate with the standard which manufacturers of appliances maintain. In Australia, prior to the existence of the scheme, there were many manufacturers earnestly striving to reach high standards, but who had not the requisite technical knowledge to attain them. By giving them inexpensive and ready access to the laboratories of the Association and their staffs they, in effect, have had attached to their organizations the whole of the resources of the Gas Industry.

THE SCHEME.

Compilation of Standard Requirements.

Draft minimum standard requirements are created by a Committee specially appointed for the purpose. These are sent for comment to all gas undertakings in Australia and New Zealand, as well as to appliance manufacturers. The comments received are considered by the Committee. Final standard requirements are then issued, published, and distributed.

Testing and Examining Appliances for Compliance with Standard Requirements, Durability of Construction, and Easy Servicing.

After standard requirements have been issued, manufacturers send appropriate appliances to one of the Association's laboratories for examination and test. The first process is to have them examined for durability of construction. Specifications of materials are not included in standard requirements because of the obvious difficulties involved. The appliance is then examined by fitters and men with servicing and maintenance experience who make suggestions on design, &c., having regard to the ready accessibility of parts, &c., with resultant ease and cheapness of service and maintenance.

When the suggested constructional alterations have been made, the appliance is submitted to laboratory tests for compliance with the appropriate standard requirements. If the appliance passes, the manufacturer is given a Certificate of Approval which entitles him to have reproductions of the appliance badged by an inspector of the Association after the inspector has submitted it to an actual service test and found it to be satisfactory. If the appliance does not pass, the manufacturer is given every assistance to bring it up to the Association's requirements. Manufacturers are not permitted to affix badges, which are in the sole charge of inspectors.

What the Badge Implies.

It will be seen that the Badge of Approval implies compliance with standard requirements, that it is durably constructed, that it is designed to ensure ease of servicing and maintenance, and that it has passed an actual service test.

Prices Charged for Laboratory Assistance and Badges of Approval.

Manufacturers are members of this Association. They pay an annual fee of £5 *plus* £5 for each appliance section to which they are attached. Thus, if a manufacturer belonged to the gas water heater section, he would pay an annual fee of £10. For this he is entitled to access to the laboratories of the Association and may avail himself of the services of the whole technical staffs. In addition to the annual subscription, manufacturers are charged one shilling for each Badge of Approval affixed.

The Badge of Approval.

It was felt that the design of the badge should be simple and readily recognizable by the general public. An attempt has been made to embody these essentials in the design which is reproduced here. It is also symbolic—the shield being an emblem of protection. The stars represent the "Southern Cross" and refer to the geographical location of the scheme's field of operation. Badges are of the domed metal or flat transfer type, and may be obtained in colours which will match the colour of the appliance.

A Reply to Anti-badge Arguments.

I have noted with interest some of the objections to appliance certification raised, from time to time, by representatives of the Gas Industry in England and would like with due deference to express my views thereon. Many of these views have been dictated by practical experience.

These objections are as follows:

1. *That it might prejudice progress.*

   Our standard requirements are not static. Desirable improvements are embodied, from time to time, as competition and progress dictate. Certificates of Approval are valid only for 12 months and are not renewed unless and until the improvements are embodied in the appliance. In this way standard requirements become an instrument of progressive development.

   It is hard to imagine such a procedure as being prejudicial to progress. On the other hand, it is easy to imagine the tardiness of progress if development were left to manufacturers many of whom might have no interest other than cheap construction and æsthetic appeal.

2. *That it might cause design to work down a minimum limit and that a Badge of Approval might tend to convey to the public that all badged appliances were of equal merit.*

   This is tantamount to saying that the better appearance of an appliance has no appeal value. Thomas Carlyle tells us that it is not our logical mensurative faculty, but our imaginative one, which is king over us. This is another way of saying that people are controlled, not by their reason, but by their sentiment. Hence it is that the æsthetic appeal is such an important factor in selling anything. It is this which will always prevent any possibility of "design working down to a minimum" or any suggestion that "all badged appliances are of equal merit."

   Badges of Approval do not, of themselves, sell appliances; they are merely a crowning feature that is only referred to when elegance and general appeal have done most of the selling job. It is then that the Badge comes along and says, in effect, to a potential purchaser, "You have preferred this appliance; that it will give satisfactory service is indicated by this Badge of Approval."

   I am of the opinion that the objection raised arises from a wrong point of view, as is evidenced by our experience in Australia where it has never materialized.

3. *That reliance on certification might diminish the responsibility of gas undertakings to the public.*

   It does not appear to me material who accepts the responsibility to the public—gas undertakings or an authority constituted on their behalf. If this responsibility were so shifted it would result in its wider acceptance. It is reasonable to assume that some gas undertakings, because of their inability to know what appliances will give good service, have this indifference forced upon them. If they were able to ascertain readily what appliances were desirable they would doubtless prefer them, thus promoting their own interests and those of the Gas Industry.

4. *That an official stamp might be accepted by the public as an unqualified guarantee, while it could only infer that the appliance bearing it would fulfil the standard when new and properly installed.*

   The Badge of Approval is an unqualified guarantee of what it implies—safety, efficiency, and durable construction of the appliance to which it is affixed. It is impossible, of course, for a badge to imply that an appliance will never wear out or that it will be properly installed, but it does go a long way to ensure satisfactory service. The public are not unreasonable. They know, for instance, that a safety razor is only so when properly used. They know also that they themselves will wear it out. Moreover, if a badged appliance be improperly installed, there is less likelihood of an accident because of the general safety provisions prescribed by standard requirements.

5. *That the Blue Star of the American Gas Association, representing as it does compliance with minimum standards, has failed to be of any merchandising value for advertising or campaign purposes. Something new, therefore, had to be developed and this led to the "Certified Performance" Range.*

   The purpose of a badge is not primarily for advertising purposes. Its purpose is set out in the propositions referred to at the beginning of this article. In desiring to popularize certified ranges, our American friends called the badge another name—Certified Performance. In doing so, they upheld the fundamental principle of certification and proved that they thought it good for advertising purposes.

In introducing the scheme in Australia, no attempt was made to cover the whole field of gas appliances. A start was made with gas water heaters and gas wash coppers. The scheme is now functioning in respect of gas cookers, while standard requirements are in preparation for gas fires, gas space heaters, and gas refrigerators. It is the ultimate intention to cover the whole field of domestic gas appliances.

The scheme is operating most successfully, which is due, in no small measure, to the earnest co-operation of appliance manufacturers who have testified that the examination of appliances in their factories by an independent inspector has played an important part in improving workmanship with its attendant economies.

In this highly emotional age where novelty and elegance might be promoted at the expense of intrinsic merit, it should be remembered that gas is on its trial long after these transient charms have cloyed. It is then that its prestige will have little to rest on but the service the appliance can give—a condition which certified appliances can assure.

COMPANY MEETING

Gas Consolidation, Ltd.

Annual General Meeting

The Annual General Meeting of Gas Consolidation, Ltd., was held on Tuesday, July 4, 1939, at Winchester House, London, E.C. 2. Major JULIAN DAY, the Chairman, who presided, said :

The Balance-Sheet contains only slight variations when the figures for this and the previous year are compared. There are, however, one or two items to which I should like to draw your attention. First, if you will turn to the assets side, you will note that investments in Subsidiary Companies stand at £891,329, as against £924,615 last year. This decrease is not the result of our relinquishing control of a subsidiary company, but is due to the sale of a holding of Preference Shares in a Company of which we already held 100% of the ordinary capital. The proceeds of this sale have been utilized to reduce our overdraft with our bankers, which now stands at £11,000 against £62,000 last year.

During the year, we acquired the Churnet Valley Gas Company, Ltd., and its acquisition accounts for the greater part of the £16,174 expended on the purchase of stocks and shares of Subsidiary Companies.

This comparatively small Company is the seventh Company in the County of Stafford to come under our control and therefore comes well within the compact geographical group we are endeavouring to build up in that part of the country. We have also entered into a contract to purchase the adjoining gas undertaking of the Cheadle Rural District Council.

Assistance to Subsidiary Companies.

Loans to our Subsidiary Companies have been reduced from £38,828 to £24,000 and guarantees given by this Company in respect of bank overdrafts of Subsidiary Companies have also been reduced from £103,000 to £79,000. During the year we have assisted the Subsidiary Companies in obtaining the funds required by them by the placing of share and loan capital at satisfactory prices. We have also aided them to borrow their requirements from their bankers at the lowest possible rates of interest instead of making loans to them direct.

Since the commencement of our financial year, the balance of £50,000 3½% debenture stock remaining to be issued has been placed on satisfactory terms.

If you will now turn to revenue account, you will see that the balance transferred to appropriation account is slightly lower at £28,599 as compared with £29,649 last year. Income has been reduced by some £700. The sale of the investment already referred to has, of course, caused a reduction in gross income.

Dividends Maintained.

The balance brought forward from last year—namely, £6,005—has been added to the balance of revenue for this year and, after the payment of the Preference dividends for the year and the interim dividends on the "A" and "B" Ordinary shares, the balance available for distribution amounts to £18,377. Your Directors now recommend the payment of final dividends of 2½% and 4%, less tax, on the "A" and "B" Ordinary shares respectively, making, with the interim dividends already paid, dividends for the year of 5%, less tax, on the "A" Ordinary and 6%, less tax, on the "B" Ordinary.

These dividends are at the same rates as last year, and the balance remaining to be carried forward is £6,821 as against £6,005.

During the year we put in operation a new retort plant of the intermittent vertical type at the Cannock Works, and we are now making cheap gas at this works.

This type of plant was installed mainly with the idea of using a large proportion of the local Cannock coals and we have now found it quite practicable to carbonize a proportion well in excess of 50% of these non-coking coals blended with good coking coals to produce an entirely satisfactory coke. This is a new technical development of some importance. To enable our requirements to be realized we had to install a coal blending plant and to have freedom of choice of suitable coals. In this latter respect our ideas clashed with the Coal Selling Committee controlling the coals which we wished to purchase. With considerable regret we were obliged to appeal against the decision of this Committee. Our appeal met with a considerable measure of success and we are now experiencing less difficulty.

Addition to Group.

As I forecast in my speech last year, we have now closed the Audley Gas-Works of the Kidsgrove Gas Company and have laid a main to supply the Audley district in bulk from the Birchenwood coke ovens which have supplied the Kidsgrove Company for some years.

At Lichfield we have put into commission during the year a new system of quenching and conveying coke from the retort house, which has been quite successful and has reduced the cost of making gas at that works.

Since last year the Mossley Gas-Works has been making all the gas not only for its consumers' requirements in Mossley and Saddleworth but also for the entire requirements of the Ashton-under-Lyne Gas Company, which latter works has been shut down. This has proved a good economy to both Companies and we are now installing some additional plant at Mossley which will effect still further economies. We are very well satisfied with the Mossley Works, which we think is one of the best in the country.

To promote the sale of gas throughout our area we have realized that it is essential that the gas supplied to the public should be of high and uniform quality and that the appliances offered to our consumers and prospective consumers should give satisfaction not only from the viewpoint of performance but also as regards appearance. The manufacturers are now producing appliances of all types on the most modern lines, and their co-operation has been of great assistance to us. During the year we have opened new showrooms in a number of our centres and have further developed the use of motor showrooms for the outlying districts. At Long Eaton a new showroom is in course of construction.

As an added attraction a number of Companies have adopted two-part tariffs which we are confident will make a wider appeal to the discriminating consumers. By means of these tariffs, consumers can, after the payment of a small service charge, enjoy the benefit of gas at half price and the resultant reductions in running costs bring within the reach of the majority of our consumers the opportunity of purchasing additional gas appliances of the latest types. Our sales of these appliances are growing rapidly, which indicates over a period an increasing consumption of gas.

Thus in both manufacture and distribution steady progress is being made throughout the Group.

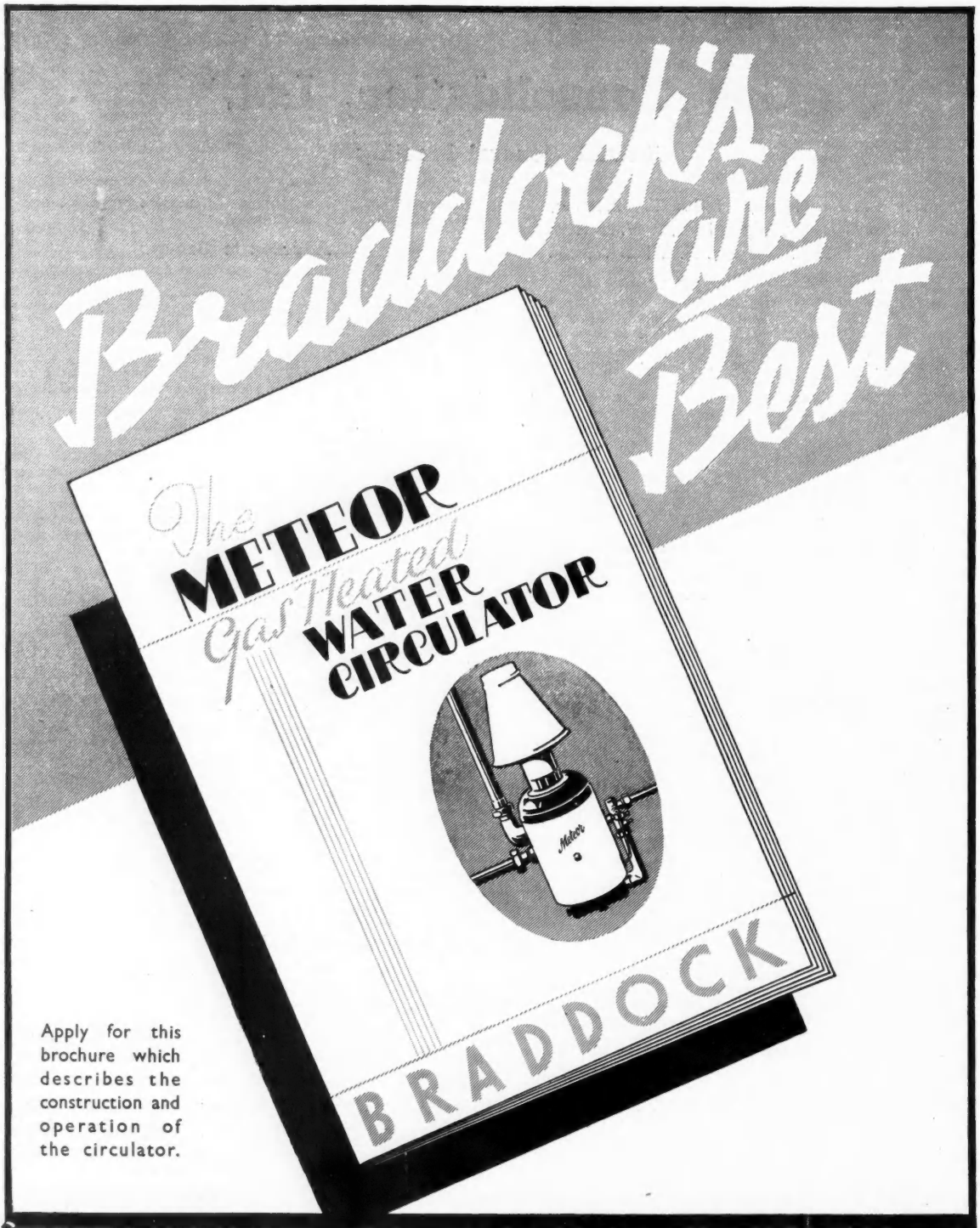
Not An Easy Year.

The operating Companies have not had an easy year financially. It was a period of rising costs and in our area, at least, a period not conducive to increased sales of gas. The economies previously established, however, and constant vigilance in inaugurating new economies have enabled the operating Companies to maintain financial stability with very few increases in the charge for gas.

During the year a pension scheme has been brought into force for the benefit of all employees of the Subsidiary Companies. The terms are very favourable and I feel sure that the shareholders of this Company will approve this scheme, which has given great satisfaction to the employees of our constituent operating Companies. The results which we obtain each year are dependent upon the goodwill and co-operation of our officials and employees and in turn I feel that we, for our part, should be prepared to guarantee their well-being when their health begins to fail and they are unable to carry on the work which has become their livelihood. There is a splendid feeling of loyalty to the organization throughout the group and we are duly grateful to the staffs and employees of our Companies.

I must also refer to the excellent results of technical management on the part of Mr. Gill and Mr. Evetts and to the great value of the legal guidance and assistance given to us by Mr. Studholme.

The Report and Accounts were unanimously adopted, and the proceedings then terminated with a hearty vote of thanks to the Chairman.



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Markets and Manufactures

Current Sales of Gas Products

The London Market

July 10.

Current values of Tar Products in the London market are as follows:

Pitch, nominal at about 25s. to 26s. per ton f.o.b.
Creosote, about 3½d. to 3¾d.
Refined tar, 3¾d.
Pure toluole, about 2s. 5d. to 2s. 6d.
Pure benzole, about 1s. 9d.
95/160 solvent naphtha, 1s. 7d. to 1s. 8d.
90/160 pyridine, about 11s.
All per gallon naked at makers' works.

The Provinces

July 10.

Crude Gas-Works Tar, 10s. to 15s.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch—East Coast, 25s. to 27s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 25s. to 27s.* Toluole, naked, North, 1s. 10d. to 1s. 11d. Coal tar, crude naphtha, in bulk, North 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5d. Heavy naphtha, North, 1s. 2½d. to 1s. 3d. Creosote, *ex* works, in bulk, North, liquid and salty, 3¾d. to 4⅛d.; low gravity, 4d. to 4¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 10d. Naphthalene, £13 10s. to £16. Salts, 70s. to 75s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality unsaleable. Heavy oil: Unfiltered anthracene oil, min. gr. 1,080, 4½d. to 4¾d.; filtered anthracene oil, min. gr. 1,080, 5¼d. to 5¾d.; heavy tar oil, gr. less than 1.080, 4¼d. to 4¾d.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls, whatever they may be.

Scotland

GLASGOW, *July* 8.

If anything, there has been a slight increase in the volume of business placed during the week, but conditions still remain difficult, with prices unchanged.

Crude gas-works tar.—Actual value is 28s. to 30s. per ton *ex* works in bulk.

Pitch of vertical quality is available in large quantities, with makers quoting 20s. to 21s. per ton f.o.b. for export and 20s. per ton *ex* works in bulk for home trade.

Refined tar.—The home market is very active at 3¼d. to 4d. per gallon, but export business is still not entirely satisfactory, with quotations at 2¾d. to 3d. per gallon, both into buyers' packages at makers' works.

Creosote oil.—Only a moderate business is being placed, with makers' prices unchanged as under: Specification oil, 3¼d. to 3¾d. per gallon; low gravity, 4¼d. to 4½d. per gallon; neutral oil, 3¾d. to 4d. per gallon; all *ex* works in bulk.

Cresylic acid.—There is very little movement in this product, and supplies can be secured as follows: Pale, 97/99%, 1s. 2d. to 1s. 3d. per gallon; dark, 97/99%, 1s. to 1s. 1d. per gallon; pale, 99/100%, 1s. 4d. to 1s. 7d. per gallon; all *ex* works in buyers' packages.

Crude naptha.—Available supplies are changing hands at round 5d. to 5¼d. per gallon *ex* works in bulk, according to quality.

Solvent naptha.—90/160 grade is 1s. 4d. to 1s. 5d. per gallon, and 90/190 heavy naphtha about 1s. 1½d. to 1s. 2d. per gallon.

Motor benzole is 1s. 3d. to 1s. 4d. per gallon.

Pyridine.—Prices are nominal, with 90/160 grade 10s. to 10s. 6d. per gallon and 90/140 grade at 12s. to 13s. per gallon.

Benzole Prices

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole..	0	9½	to	0	10	per gall. at works
Motor „ ..	1	3	„	1	3½	„ „ „
90% „ ..	1	4	„	1	4½	„ „ „
Pure „ ..	1	8	„	1	8½	„ „

Contracts Advertised To-Day

Carburetted Water Gas Plant.
Market Harborough Gas Department. [p. 126.]

Gasholder.
Rhondda Gas Department. [p. 126.]

High Pressure Main Laying.
Rhondda Gas Department. [p. 126.]

Spun Cast Iron or Steel Pipes.
Rhondda Gas Department. [p. 126.]

Brechin Gas Company

The annual report of the Directors of Brechin Gas Company, Ltd., shows that, after providing for depreciation and dividend on Preference shares, there remains £2,557 at the credit of the profit and loss account, including the amount brought forward. The Directors recommend a dividend on the Ordinary shares of 2s. 6d. per share, and a bonus of 9d., both less income-tax, absorbing £2,121. This leaves to be carried forward, subject to Directors' remuneration, £437. Gas manufactured amounted to 58,036,000 cu.ft., an increase over last year of 406,000 cu.ft.

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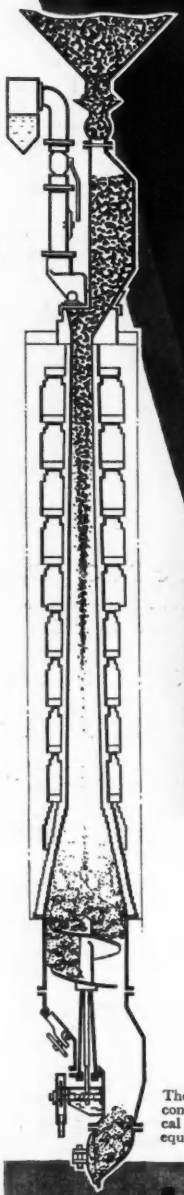
E.C.4.

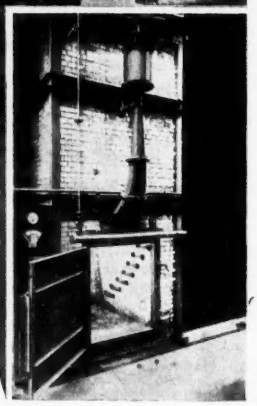
WEST'S

Three installations of Glover-West vertical retorts, with coke-grading and waste-heat recovery equipment, at the Cottesloe gasworks of the Johannesburg Municipal Gas Department, and (*below*) step-grate producer equipped with steam-jet air injector to facilitate the burning of small coke and breeze under pressure—a view in the Glover-West vertical retort house at the Meadow Lane works of the Leeds Corporation Gas Department.

Carbonizing Plants



The Glover-West continuous vertical retort and equipment.



- Increased capacity in relation to ground area covered.
- Output readily adjustable to meet fluctuating demands.
- High yields of gas and coke with low maintenance costs.
- Clean working conditions within the retort house.
- Modern building design and smokeless operation.

WEST'S GAS IMPROVEMENT COMPANY, LTD.
MILESPLATTING, MANCHESTER 10 & COLUMBIA HOUSE, ALDWYCH, W.C.2

Glover-West Vertical Retorts
AND WESTVERTICAL CARBONIZING CHAMBERS

434 PLANTS BUILT OR ORDERED IN 24 COUNTRIES

GAS STOCKS AND SHARES

A little more business was transacted last week, and prices in many directions moved slightly upwards. At the close the tone was quite cheerful, and although at the time of writing it is rather difficult to sense any improvement in the political outlook to account for this optimism, it would be well for the country if this spirit could continue.

Gilt-edged stocks led the way, being better supported than for some time past, and they closed fractionally higher on the week. Home railways finished the half-year well, the aggregate traffic receipts showing a welcome recovery, and prices hardened though lack of support prohibited any sensational movements. Oil and mining shares were firm, but little interest was taken in rubber, which remained neglected.

The gas market opened quietly, though later in the week more support was forthcoming. This was not sufficient, however, to bring about any improvement in values, the majority of changes being in a downward direction. Among "ordinaries," South Metropolitan fell a further 3 points to 84½, Brighton, Wandsworth, and Imperial Continental dropped 2 points each, and it will be seen in the list below that a few fixed-interest stocks also reacted a point or two. With the exception of a drop of 5 in Great Yarmouth 8½% to 27½, quotations on the Provincial Exchanges and in the Supplementary List were practically unchanged.

The list of gas preference stock available covers a wider range of securities than for some time past and contains several parcels of stock usually firmly held and not readily obtainable. The yields are good for the security offered, and no well-spread list of investments should be without a few of these holdings. The following are among those on offer:

Amount Offered.	——	Price.	Gross Flat Yield.
£			£ s. d.
5,000	Barnet Gas and Water 4¼%	108	4 3 3
150	Brighton, Hove, and Worthing 4%	90	4 9 0
50,000	British 5½% Cum. Red. (Red. 1967 at 105%) ..	115	4 15 9
249	Croydon 4%	90	4 9 0
2,000	Gas Light 4%	93	4 6 0
100	Hornsey 5%	105	4 15 3
320	North Middlesex 5%	107	4 13 6
10,000	Severn Valley 4½% Cum. £1	21/– free	4 5 9
1,000	South Metropolitan 4%	89	4 9 9
375	Tottenham 5%	107	4 13 6
1,200	Wandsworth 4%	88	4 11 0
1,250	Watford 5½%	112	4 18 3

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last. Hf. Yr. % p.a.	NAME.	Quotations July 7.	Rise or Fall on Week.
1,767,439	Mar. 6	8	8	Alliance & Dublin Ord. ...	130—140	...
374,000	June 19	4	4	Do. 4 p.c. Deb. ...	88—93	...
877,576	May 8	5	5	Asscd.Gas&WaterU'd'tsOrd.	16/—18/–	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/—21/–	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	17/—19/–	...
318,730	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	16/—18/–	...
750,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	...
560,070	Feb. 20	7	7	Barnet Ord. 7 p.c. ...	150—160	...
300,000	Apl. 6	1/4½	1/9⅜	Bombay, Ltd.	19/—21/–	...
181,185	Feb. 20	9½	9½	Bournemouth sliding scale ...	185—195	...
690,526	,,	7	7	Do. 7 p.c. max. ...	153—158	...
493,960	,,	6	6	Do. 6 p.c. Pref. ...	125—130	...
50,000	June 5	3	3	Do. 3 p.c. Deb. ...	70—75	...
362,025	,,	4	4	Do. 4 p.c. Deb. ...	95—100	...
335,000	,,	5	5	Do. 5 p.c. Deb. ...	110—115	...
357,900	Feb. 20	7½	7½	Brighton, &c., 6 p.c. Con. ...	133—138	−2
659,955	,,	6⅜	6⅜	Do. 5 p.c. Con. ...	118—123	...
205,500	,,	6	6	Do. 6 p.c. 'B' Pref.	110—115	...
855,000	Mar. 20	7	8	British Ord.	100—110	...
100,000	June 19	7	7	Do. 7 p.c. Pref.	136—141	...
350,000	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	...
450,000	,,	5	5	Do. 5 p.c. Red. Deb. ...	98—103	...
450,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
100,000	22 May '33	6	4	Cape Town, Ltd.	½—1½	...
100,000	6 Nov. 33	4½	4½	Do. 4½ p.c. Pref. ...	1—2	...
150,000	June 19	4½	4½	Do. 4½ p.c. Deb. ...	58—68	...
626,860	Feb. 6	6	6	Cardiff Con. Ord.	112—117	...
237,860	June 5	5	5	Do. 5 p.c. Red. Deb. ...	102—107	...
98,936	Mar. 20	2/–	2/–	Colombo Ord.	1 15/16—1 7/8	...
24,510	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref. ...	22/—24/–	...
739,453	Mar. 20	–/11.48	–/11.48	Colonial Gas Assn. Ltd. Ord.	16/—18/–	...
296,144	,,	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	23/—25/–	...
1,775,005	Jan. 23	5	4	Commercial Ord.	53—58	...
140,000	Feb. 6	§13/4	4	Do. 4 p.c. Red. Pref. ...	95—100	...
620,000	June 5	3	3	Do. 3 p.c. Deb. ...	59—64	...
286,344	Feb. 20	5	5	Do. 5 p.c. Deb. ...	105—110	...
200,000	,,	§4	4	Do. 3½ p.c. Red. Deb....	95—100	...
807,560	Feb. 20	7	7	Croydon sliding scale ...	123—128	...
644,590	,,	5	5	Do. max. div.	94—99	...
620,385	June 19	5	5	Do. 5 p.c. Deb. ...	107—112	...
239,000	Feb. 6	5	5	East Hull Ord. 5 p.c.	88—93	...
187,215	Feb. 6	6	6	East Surrey Ord. 5 p.c. ...	102—107	...
176,211	June 5	5	5	Do. 5 p.c. Deb....	105—110	...
250,000	July 3	4	8	Gas Consolidation Ord. 'B' ...	18/6—20/6*	—/6
250,000	May 22	4	4	Do. 4 p.c. Red. Cum. Pref.	17/—19/–	...
19,189,963	Feb. 6	5⅜	5⅜	Gas Light & Coke Ord. ...	20/6—21/6a	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max. ...	68—73	−1
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	88—93	−1
2,993,000	July 3	3½	3½	Do. 3½ p.c. Red. Pref. ...	90—95*	−2
8,602,497	May 22	3	3	Do. 3 p.c. Con. Deb....	70—75	...
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb....	105—110	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb....	102—107	...
700,000	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
270,466	Feb. 20	6	6	Harrogate New Cons. ...	93—103	...
157,500	Mar. 20	‡1/–	‡1/–	Hong Kong and China Ord. ...	⅞—1	...
213,200	Feb. 6	5⅜	6	Hornsey Con. 3½ p.c....	93—98	...
5,600,000	May 8	8	12	Imperial Continental Cap. ...	108—118	−2
172,810	Jan. 23	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
235,242	Mar. 6	8⅜	8⅜	Lea Bridge 5 p.c. Ord. ...	145—155	...
63,480	June 19	3	3	Maidstone 3 p.c. Deb. ...	57—62	...
45,000	May 22	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	125—130	...
392,000	Apl. 6	5½	5½		98—103	...
231,977	Feb. 20	5	5	M.S. Utility 'C' Cons. ...	95—100	...
968,658	,,	4	4	Do. 4 p.c. Cons. Pref. ...	83—88	...
390,076	June 19	4	4	M.S. Utility 4 p.c. Deb. ...	90—95	...
148,955	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...
125,000	July 3	3½	3½	Do. 3½ p.c. Red. Bds.	92—95*	−2
675,000	May 8	†6	†3	Montevideo, Ltd.	55—65	...
250,000	Mar. 6	7½	7½	North Middlesex 6 p.c. Con.	135—140	...
396,160	Feb. 6	5	5	Northampton 5 p.c. max. ...	103—108	...
300,000	April 24	†9	†7	Oriental, Ltd.	135—145	...
468,537	June 5	7⅜	8	Plymouth & Stonehouse 5 p.c.	112—122	...
621,667	Feb. 20	8½	8½	Portsmouth & Gosport Cons.	135—145	...
241,446	,,	5	5	Do. 5 p.c. max. ...	97—102	−1
73,350	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
75,000	,,	4	4	Do. 4 p.c. Pref. ...	82—87	...
114,000	Feb. 6	5	5	Preston 5 p.c. Pref.	102—107	...
247,966	June 19	4	4	Primitiva 4 p.c. Cons. Deb. ...	95—100	...
625,959	Jan. 9	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...
15,000	Mar. 6	6	6	San Paulo 6 p.c. Cum. Pref. ...	7⅜—8⅜	...
441,275	May 8	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	20/—22/–	...
460,810	Mar. 20	–/10½	–/10½	,, ,, 4½ p.c. Cum. Pref.	19/—21/–	...
133,201	Mar. 6	8½	5	Shrewsbury 5 p.c. Ord. ...	141—146	...
9,000	June 5	‡4	‡4	South African Ord.	4—5	...
1,371,752	April 24	1/2⅝	1/2⅝	South East'n Gas Cn. Ld. Ord.	20/6—22/6	...
871,636	Mar. 6	–/10⅜	–/10⅜	Do. 4½ p.c. Red. Cum. Pref.	19/—21/–	...
498,818	,,	4	4	Do. 4 p.c. Cum. Pref. ...	17/—19/–	...
450,000	Feb. 6	4	4	Do. 4 p.c. Deb.	95—100	...
150,000	,,	3½	3½	Do. 3½ p.c.Red. Deb. ...	90—95	...
6,709,895	Feb. 6	5	6	South Met. Ord.	82—87	−3
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	118—123	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	84—89	−1
1,895,445	June 19	3	3	Do. 3 p.c. Deb.	68—73	...
1,000,000	Jan. 9	5	5	Do. 5 p.c. Red. Deb. ...	105—110	...
600,000	,,	§31/–	3⅜	Do. 3⅜ p.c. Red. Deb. ...	93—98	...
1,543,795	Jan. 23	6	6	South Suburban Ord. 5 p.c. ...	103—108	...
512,825	,,	5	5	Do. 5 p.c. Pref.	103—108	...
500,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
250,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	90—95	...
888,587	June 5	5	5	Do. 5 p.c. Deb.	107—112	...
250,000	,,	4	4	Do. 4 p.c. Deb.	89—94	...
200,000	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
427,859	Apl. 6	9⅜	1/2½	S.Western Gas &Water Ord.	15/—17/–	...
160,523	Apl. 6	–/10½	–/10½	Do. 4½ p.c. Red. Cum. Pf.	18/6—20/6	...
110,000	June 5	4	4	Do. 4 p.c. Red. Deb. ...	92—97	...
750,541	Feb. 6	5	5½	Southampton Ord. 5 p.c. ...	102—107	...
148,836	June 5	4	4	Do. 4 p.c. Deb. ...	89—94	...
350,000	Feb. 6	5½	5½	Swansea 5½ p.c. Red. Pref. ...	104—109	...
200,000	June 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94*	...
1,076,490	Feb. 20	6⅜	6⅜	Tottenham and District Ord.	110—115	...
409,835	,,	5½	5½	Do. 5½ p.c. Pref.	110—115	...
62,235	,,	5	5	Do. 5 p.c. Pref.	102—107	−1
453,380	June 19	4	4	Do. 4 p.c. Deb.	87—92	−2
85,701	June 5	6	6	Tuscan 6 p.c. Red. Deb. ...	95—100	...
1,131,550	May 8	4	6	U. Kingdom Gas Cor. Ord. ...	15/6—17/6	...
1,051,280	May 8	4⅜	4⅜	Do. 4½ p.c. 1st Cum. Pref.	17/—19/–	...
762,241	,,	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	18/—20/–	...
745,263	June 5	4½	4½	Do. 4½ p.c. 2nd Non-Cum.Pf.	13/6—15/6	...
1,066,186	Mar. 6	3½	3½	Do. 3½ p.c. Red. Deb. ...	92—97	+2
378,106	Mar. 6	7	7	Uxbridge, &c., 5 p.c. ...	120—125	...
133,010	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
1,371,138	Jan. 23	7	7	Wandsworth Consolidated ...	110—115	−2
2,525,768	,,	4	4	Do. 4 p.c. Pref. ...	84—89	−1
1,343,964	June 19	5	5	Do. 5 p.c. Deb. ...	107—112	...
383,745	,,	4	4	Do. 4 p.c. Deb. ...	89—94	...
400,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Deb. ...	92—97	...
558,342	Feb. 6	6½	6½	Watford and St. Albans Ord.	112—117	...
200,000	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
200,000	,,	5½	5½	Do. 5½ p.c. Pref. ...	108—113	−2
200,000	,,	§16/8	4	Do. 4 p.c.Rd.Pf.(1973/8) .	93—98	...
100,000	—	—	—	Do. 4 p.c.Red.Pf.(1959)	97—102	...
200,000	June 19	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...
200,000	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	83—88	...

a.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Cont.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations July 7.	Rise or Fall on Week.
202,152	Mar. 20	5	5	Ascot Ord.	99— 04	...
128,182	July 3	5	5	Do. 5 p.c. Pref. ...	101—106*	−2
31,035	Mar. 20	−/4'	−/4'	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	June 19	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
17,000	Feb. 20	8	8	Bognor Orig. Ord. 'A' ...	140—150	...
62,210	,,	8	8	Do. New Add. 'A' ...	140—150	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	135—145	...
37,440	Feb. 6	10	10	Cam. Univ. & Town 10 p.c.max.	165—175	...
125,970	,,	7	7	Do. 7 p.c. max	115—125	...
39,025	,,	5	5	Do. 5 p.c. max.	95—100	...
96,410	Feb. 6	4½	4½	Cardiff 4½ p.c. Pref.	93—98	...
150,000	Feb. 20	4	4	Croydon 4 p.c. Pref. ...	91—96	...
130,000	June 19	4	4	Do. 4 p.c. Deb. ...	90—95	...
65,000	Mar. 6	7⅛	7⅛	Eastbourne 'A' 5 p.c. ...	122—132	...
198,000	,,	6	6⅜	Do. 'B' 3⅛ p.c.	105—115	...
112,312	,,	5	5	Do. 5 p.c. Pref.	102—107	...
130,000	June 19	5	5	Do. 5 p.c. Deb.	105—110	...
24,000	Feb. 20	8½	8½	Great Yarmouth 8½ p.c. max.	25—30	−5
59,400	,,	7½	7½	Do. 7½ p.c. max.	27—32	...
51,160	June 5	5½	5½	Do. 5½ p.c. Deb.	115—120	...
152,600	Feb. 20	8	9	Guildford Cons.	150—160	...
54,055	,,	5	5	Do. 5 p.c. Pref. ...	102—107	...
68,250	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
156,600	Feb. 20	7	7	Hampton Court Cons. ...	103—113	...
80,000	Mar. 6	4	4	Lea Bridge 4 p.c. Pref. ...	82—87	...
60,000	,,	6	6	Do. 6 p.c. Pref.	118—123	...
94,876	June 5	4	4	Do. 4 p.c. Deb.	87—92	...
73,620	Mar. 6	8⅔	8⅔	Luton Cons. 'A'	150—160	...
107,960	Mar. 20	4	5⅓	Mid Kent Ord.	8⅓—9⅓	...
230,940	Feb. 6	10	10	Oxford & District Ord. ...	165—175	...
47,112	,,	5	5	Do. 5 p.c. Pref.	102—107	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	108—113	...
126,193	May 8	7½	7½	Peterborough Ord.	134—139	...
64,990	Mar. 6	7½	7½	Redditch Ord.	115—125	...
166,850	Feb. 6	8	8	Romford Ord.	137—142	...
60,000	,,	4	4	Do. 4 p.c. Pref.	97—102	...
44,000	Mar. 20	5	5	Do. 5 p.c. Deb.	107—112	...
25,570	Feb. 6	5½	5½	Rugby 5½ p.c. Pref.	118—123	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	103—108	...
42,750	June 5	5½	5½	Do. 5½ p.c. Deb.	113—118	...
110,950	Feb. 20	8	8	Ryde Ord.	137—147	...
270,086	Mar. 20	7	7	Slough Ord.	120—130	...
21,000	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
28,872	May 8	5⅛	5⅛	S. Midland Gas Cpn. Ltd. Ord.	16/—18/-	...
28,866	Mar. 6	4⅛	4⅛	Do. 4⅛ p.c. Red. Cum. Pref.	17/—19/-	...
117,228	Feb. 20	5	7	Swindon Cons.	100—105	...
60,425	June 5	5	5	Do. 5 p.c. Deb.	103—108	...
64,380	June 19	5	5	Torquay & Paignton 5 p.c. Pref.	102—107	...
130,000	Feb. 6	5	8	Wakefield Ord.	116—121	...
81,650	,,	5	5	Do. 5 p.c. max.	92—97	...
82,000	Jan. 23	6	6	Weymouth Ord.	101—106	...
98,384	Feb. 6	6	6	Wolverhampton 6 p.c. Pref....	115—120	...
160,000	June 19	5⅛	5⅛	Do. 5⅛ p.c. Rd.Db.	102—107	...
90,000	June 19	5	5	York 5 p.c. Red. Deb. ...	102—107	...
133,640	Feb. 20	6⅛	6⅛	Yorktown (Cam.) 5 p.c. Cons.	115—120	...
120,000	,,	5	5	Do. 5 p.c. Pref.	102—107	...
35,000	June 19	5⅛	5⅛	Do. 5⅛ p.c. Deb.	110—115	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 7.	Rise or Fall on Week.
347,756	Feb. 6	5	6	Bath Cons.	115—117	...
1,667,250	Feb. 6	5	5	Bristol, 5 p.c. max.	105—108	...
120,420	June 5	4	4	Do. 1st 4 p.c. Deb. ...	96—100	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	96—100	...
328,790	,,	5	5	Do. 5 p.c. Deb.	113—116	...
274,000	Feb. 20	5	5	Newport (Mon.) 5 p.c. max. ...	95—97	...
13,200	Mar. 20	7	8⅓	Pontyp'l Gas & W. 10 p.c. 'A'	12⅝—13⅛	...
13,600	,,	6	5	Do. 7 p.c. 'B' ...	11—12	...
40,000	,,	6	5	Do. 7 p.c. 'C' ...	11—12	...
140,778	Feb. 6	5	5	Weston-super-Mare Cons. ...	103½—105½	...
64,338	June 19	4	4	Do. 4 p.c. Deb. ...	97—99	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb. ...	146—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 7.	Rise or Fall on Week.
157,150	Feb. 6	5	6½	Chester 5 p.c. Ord.	107—110	...
92,500	June 5	4	4	Do. 4 p.c. Pref.	94—98	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	86—89	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—100	...
2,167,410	Feb. 20	6	6	Liverpool 5 p.c. Ord. ...	115—117	...
245,500	June 19	5	5	Do. 5 p.c. Red. Pref. ...	100—105	...
306,083	Jan. 23	4	4	Do. 4 p.c. Deb.	99—101	...
106,280	Feb. 6	10	10	Preston 'A' 10 p.c.	177—187	...
188,219		7	7	Do. 'B' 7 p.c.	129—139	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 7.	Rise or Fall on Week.
122,577	Feb. 20	8	8	Blyth 5 p.c. Ord.	157½—158½	...
732,000	Feb. 20	3	3	Hartlepool G. & W. Cn. & New	76—78	+1
2,061,315	Feb. 6	5	5⅔	Newcastle & Gateshead Con.	21/—21/6a	...
682,856	,,	4	4	Do. 4 p.c. Pref. ...	88—89	...
776,706	June 5	3½	3½	Do. 3½ p.c. Deb. ...	85½—87½	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	101—103	...
332,351	Feb. 6	6	6	Sunderland 6 p.c. max. ...	132½—134½	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 7.	Rise or Fall on Week.
542,270	Feb. 6	6	9	Derby Con.	132—137	...
55,000	June 19	4	4	Do. 4 p.c. Deb.	100—105	...
20,000	June 19	5	5	Long Eaton 5 p.c. Pref. ...	10—12	...
80,000	,,	5	5	Do. 5 p.c. Deb. ...	102—107	−1

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 7.	Rise or Fall on Week.
10,000	Feb. 6	10	10	Great Grimsby 'A' Ord. ...	180—190	...
6,500	,,	10	10	Do. 'B' Ord. ...	180—190	...
79,000	,,	10	10	Do. 'C' Ord. ...	175—185	...
1,806,339	Feb. 20	6½	6½	Sheffield Cons.	137—140	...
95,000	July 3	4	4	Do. 4 p.c. Deb.	99—101*	−1

a The quotation is per £1 of Stock.
* Ex div.

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